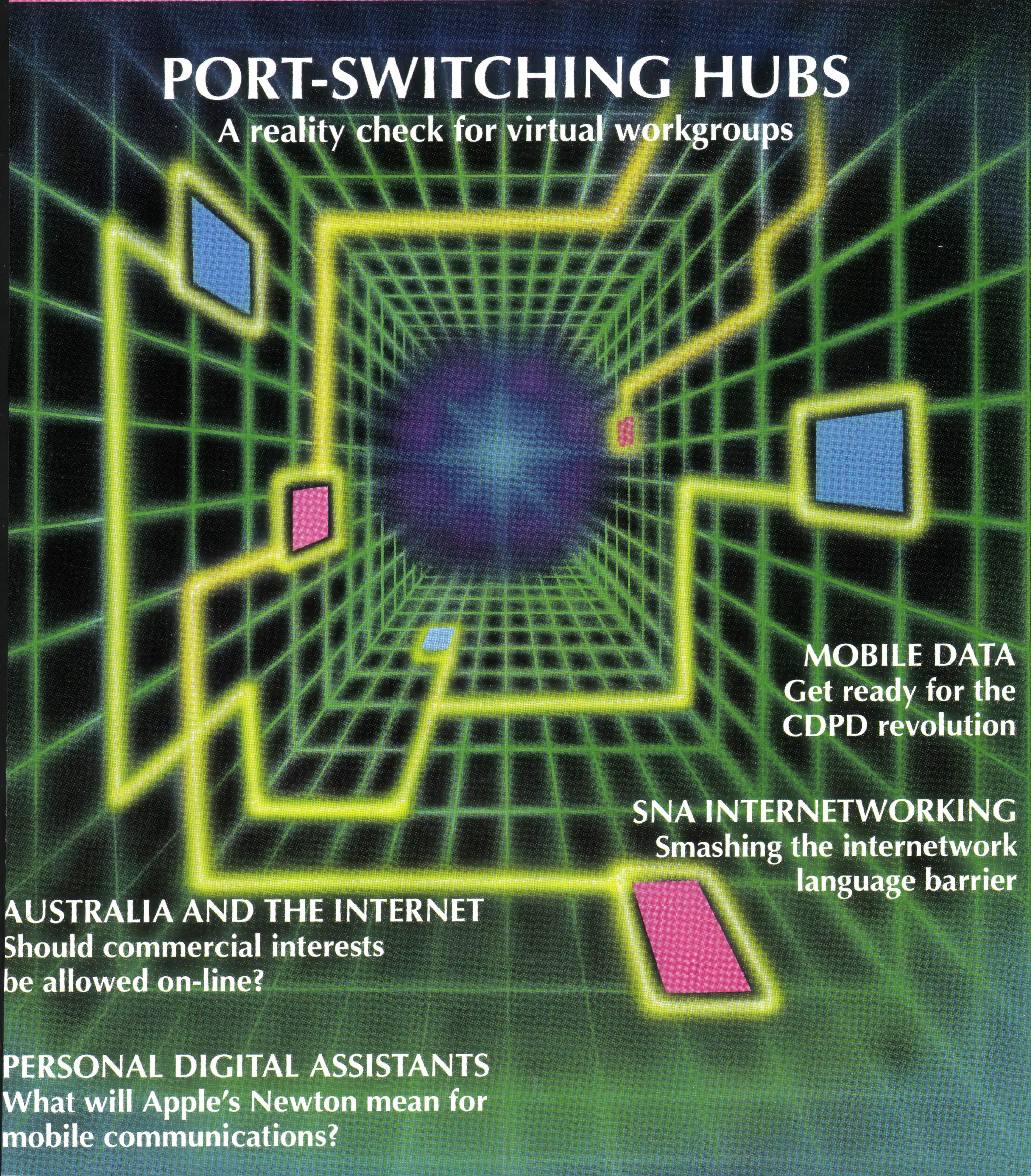
AUSTRALIAN
communications

SEPTEMBER 1993 The Networking and Telecommunications Management Magazine $5.50



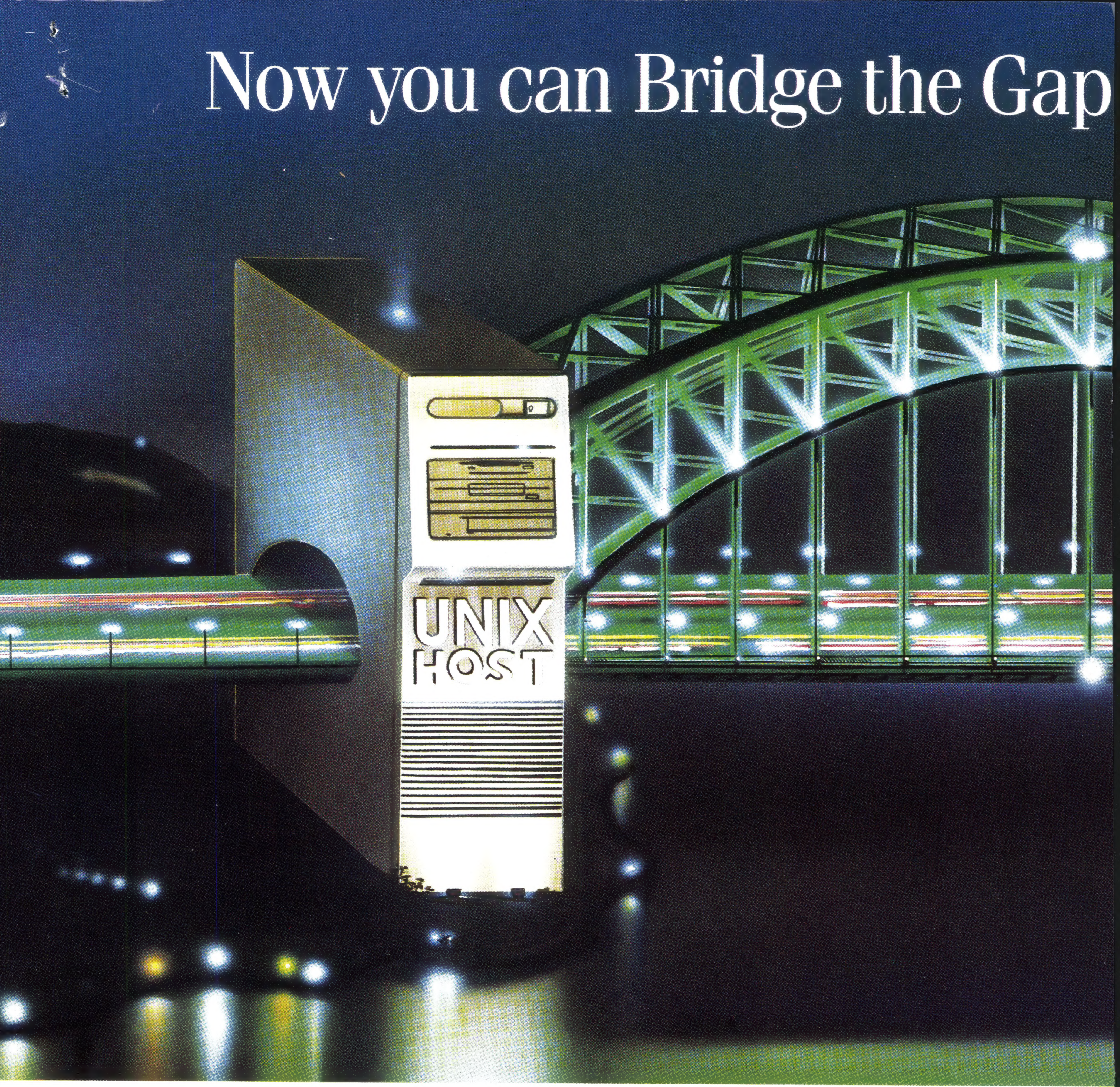
PORT-SWITCHING HUBS
A reality check for virtual workgroups

MOBILE DATA
Get ready for the CDPD revolution

SNA INTERNETWORKING
Smashing the internetwork language barrier

AUSTRALIA AND THE INTERNET
Should commercial interests be allowed on-line?

PERSONAL DIGITAL ASSISTANTS
What will Apple's Newton mean for mobile communications?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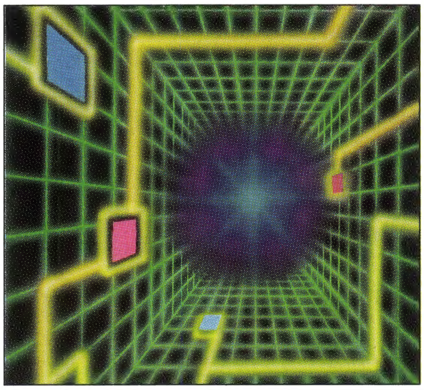
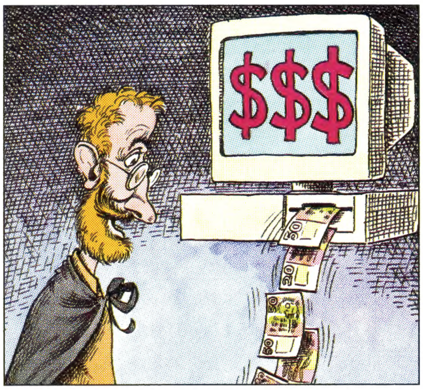


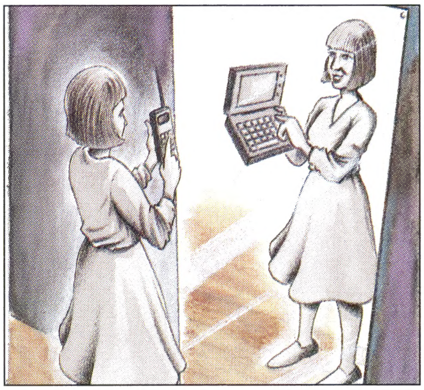
PORT-SWITCHING HUBS 67

Virtual workgroups, which allow employees to team up without regard to physical location, are well on the way to reality. A new class of networking product — the port-switching hub — is expected to be the preferred way to implement these virtual get togethers. It's easy to see why network managers are enthusiastic about port-switching hubs — they give all connected users full speed access to all resources, regardless of location. The handful of port-switching products now available look to be solid performers. But it remains to be seen if they will stand up to the rigours of handling large numbers of logical workgroups.



AUSTRALIA AND THE INTERNET 77

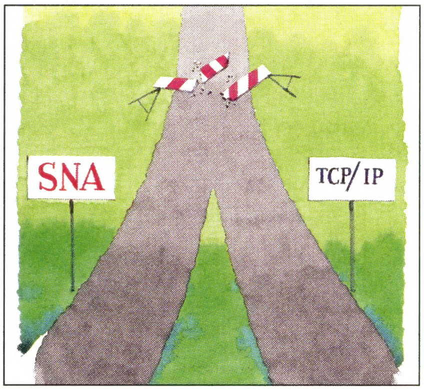
Originally an academic and research network, the Internet has grown to encompass a range of diverse groups, including — surreptitiously — business. According to the last census, it has nearly 1.5 million hosts, and, of the 175 countries connected to the Internet, Australia is the second heaviest user, behind the United States. The Australian end of Internet, AARNet, has around 60,000 computers connected to it, and 300,000 users. With this sort of coverage, it's not surprising that there are increasing calls from the business community for the network to become more easily available to all. Kester Cranswick explores the issues.



MOBILE DATA 85

Telecom and BellSouth are both gearing up to provide mobile data services in Australia. But while public-access mobile data systems are just starting here, they are relatively mature in Europe and America, where the big names are Ardis, BellSouth (with RAM) and several others. We'll soon have BellSouth using Ericsson's Mobitex system (as used by RAM Mobile Data in the US); with Telecom hotly contesting the market with Motorola's Ardis system. These are both to be public access networks using packetised data transmissions. Stewart Fist examines the industry and the emergence of Cellular Digital Packet Data, a new technology that might radically change it.

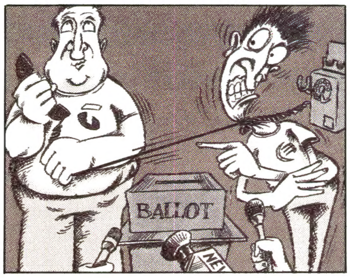
SEPTEMBER 1993



SNA INTERNETWORKING 93

The great unification of corporate networks finally is bringing the culture clash between IBM's Systems Network Architecture and TCP/IP into the open. SNA and TCP/IP developers are currently approaching the integration task independently, using their own terminology to describe the intersection. For SNA internetworking to realise its full potential, users and vendors on both sides will eventually have to come up with an integrated taxonomy to go along with their integrated networks. The first step to overcoming the language barrier is to understand the technology issues for integrating SNA and TCP/IP backbones.

ANALYSIS



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With the ballot campaign about to begin in the ACT, Optus revealed that many calls placed on its network were being 'lost.'

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Is Apple's Newton MessagePad the harbinger of the PDA revolution or simply another good idea waiting for an application?

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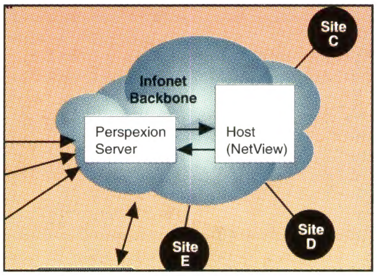

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Able to dynamically allocate bandwidth, the Marathon 10K is well-suited to remote offices.

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Protools' Foundation Manager provides RMON MIB and Ethernet alerts to IBM's NetView.

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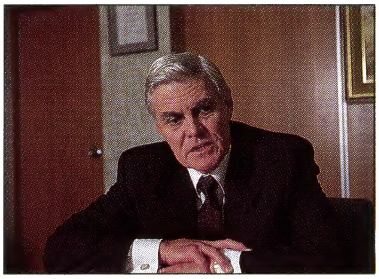
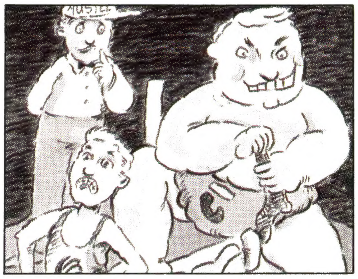
65 **Terry Cutler** examines what will happen after the ballot. He contends that it's shaping up as a lose-lose situation, whatever its outcome.

INTERVIEW



59 Bill Page-Hanify
As the Chairman and Managing Director of Alcatel Australia, Bill Page-Hanify heads up the driving force behind Australia's telecommunications exports performance.

LEGAL LINE



55 Mobile Dominance on the Move
After a lengthy examination, Austel has recently ruled that Telstra remains dominant in the provision of PMTS. Peter Leonard backgrounds and reviews this latest ruling.

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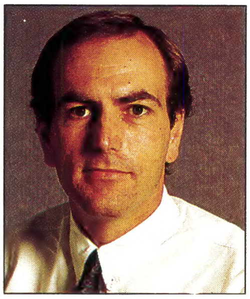

If a week is a long time in politics, then five years is an eternity in trade press publishing. Together with our regular features, with this edition we've indulged in a little reminiscing to celebrate the last five years of *Australian Communications*.

Since its debut in its current form with the September 1988 edition, *Australian Communications* has faithfully chronicled the momentous regulatory and technical changes which have occurred in the industry during that time. Throughout, we've done our best to report the twists and turns of policy and development of technology in an informed and impartial way (although looking back through the early issues, there can be very little doubt where the magazine and its contributors stood on the issue of deregulation!).

That we've managed to do so successfully for five years is a tribute to the skills and expert knowledge of our many contributors. And those skills are increasingly recognised both inside and outside of Australia and New Zealand, as our rising circulation figures show (over 12% of our regular print run is now distributed to overseas subscribers).

With revolutionary technology on our doorstep, the increasing convergence of computers and communications, and the promise of a brave new competitive world, the changes coming up in the next five years promise to be just as exciting.

M A Smeaton

AUSTRALIAN
communications

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Subscriptions
Australian Communications is available by paid subscription for $54 per annum. Subscribers receive eleven issues per annum.

Overseas Rates by Air	1 Year	2 Years
New Zealand, Papua New Guinea	$66	$110
Singapore, Indonesia, Malaysia, Brunei, Pacific Islands	$72	$122
Asia — including Hong Kong, India, Korea, Japan, Taiwan	$78	$133
Europe, North America, Middle East, South America	$92	$168

Publishers
Published and distributed monthly by Ostasun Pty. Ltd. (ACN 003 606 102) under licence from ACP Computer Publications, a division of ACP Publishing Pty. Ltd. (ACN 053 273 546) of 54 Park Street, Sydney NSW 2000. ISSN 0818-9021. **Address:** Level 4, 541 Kent Street, Sydney NSW 2000. **Tel:** (02) 264 2200 **Fax:** (02) 264 2244.
Printed at **Offset Alpine Printing**, Derby & Wetherill Streets, Silverwater NSW 2141

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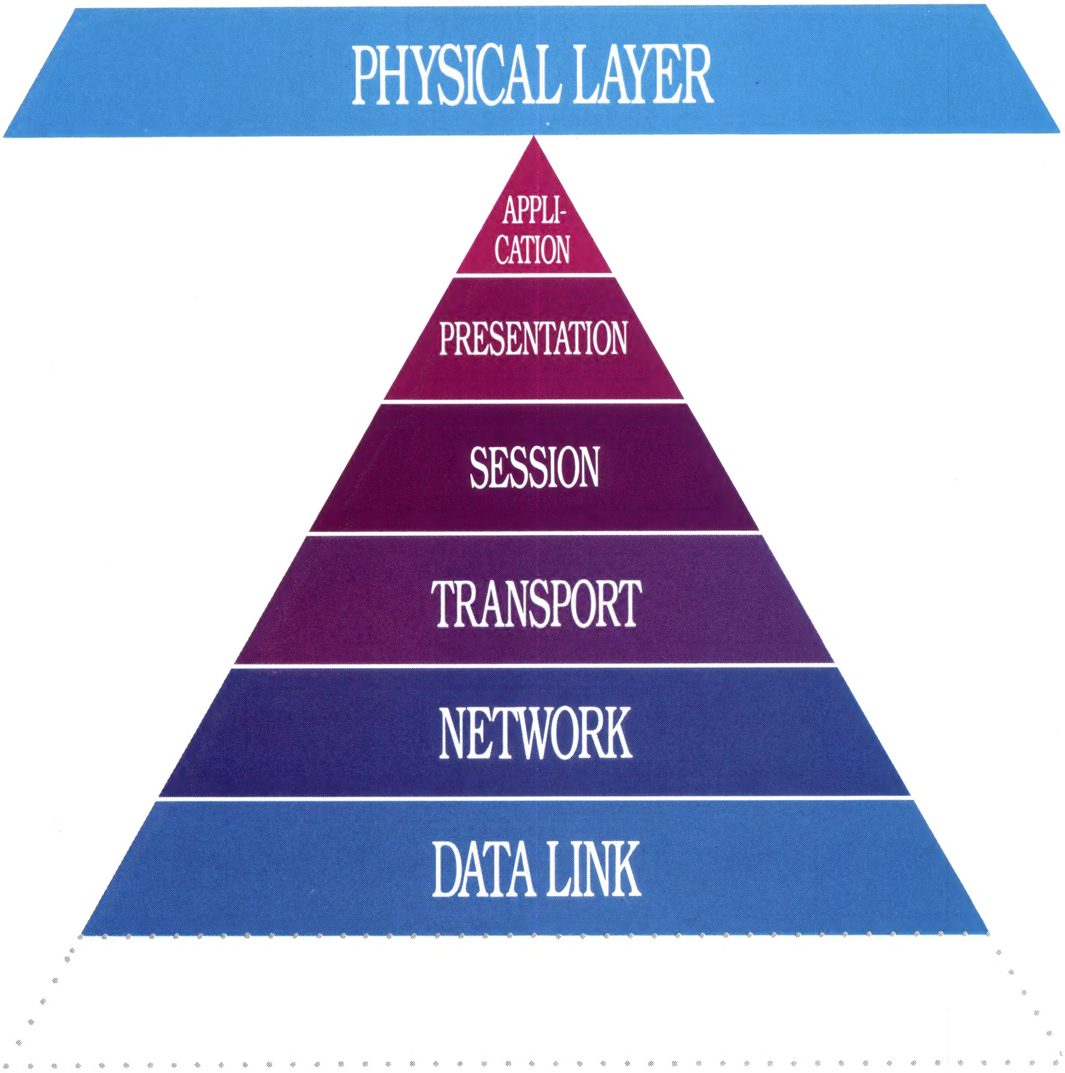

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(Just like your CD player uses digital technology to sharpen up your hi-fi at home.)

And you'll be able to enjoy all kinds of other useful benefits, such as longer talk time, greater security, as well as a personal answering and personal message service.

Remember though, this is only what we've accomplished in our first year.

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'yes'

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For more information about the Optus Mobile Digital Service, just call Optus on 008 555 000.

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Telecom to Challenge Austel Ruling

With rival carrier, Optus Communications, claiming to have captured around 20% of the mobile market, Telecom has decided to mount a Supreme Court challenge to overturn Austel's decision that it maintains a dominant position in the provision of mobile services.

Austel was called upon to rule on the issue of which carrier was dominant in the public mobile telecommunications services market after complaints by Optus that Telecom was offering special discounts in an effort to woo back lost customers. These discounts were not available to all Telecom customers.

Under the terms of the *Telecommunications Act, 1991,* the dominant carrier is not permitted to offer charges outside the tariffs it has filed with Austel.

The industry regulator found that Telecom remains dominant because of its exclusive ownership of the AMPS network; the leverage it can obtain from its ownership of the PSTN and its 'whole of business' service operations which enables it to operate without significant constraint; the extent of 'asymmetrical market opportunities' from which it benefits; and the level of mobiles market share it currently holds.

In the writ filed by Telstra against the decision, the carrier reportedly argues that Optus has already achieved not less than 20% of the mobile market, and is increasing that share by an average of 1.5% per month. It also claims the Telecom is constrained by infrastructure costs and overheads from effectively competing on price.

The Supreme Court action follows Optus' decision earlier this year to challenge the validity of Telecom's Strategic Partnership Agreements with large customers in the Federal Court.

Optus was last month reported to have reached $600 million annual turnover and to hold 13% of the combined long distance and mobile markets.

Telecom Plus Cleared by TPC

Telecom Plus has been cleared by the Trade Practices Commission (TPC) of charges of anti-competitive conduct in the EDI industry, which were brought last year by National Electronic Interchange Services (NEIS).

NEIS alleged that Telecom Plus had contravened Section 46 of the *Trade Practices Act* by offering its potential customers free software, free installation/integration and free EDI transactions. Section 46 of the Act prohibits a company with substantial market power from taking advantage of that power for the purpose of eliminating or damaging a competitor.

In its report the TPC said that it was not satisfied that AOTC took advantage of its power for any proscribed purposes under Section 46. The report said that 'Telecom Plus is engaging in an intense competitive battle with other vendors in an attempt to establish market presence.'

New Network Boundary?

Austel has issued a draft report recommending a new network boundary for Telecom, which the regulator says should result in lower residential and business telephone installation charges.

The report says the Government's objectives of full competition in the supply of cabling and equipment would be better achieved by the determination of the building line as single, technology-neutral reference point for the network boundary.

It states that the current network boundary, which is the first phone socket in residential premises and the main distribution frame in commercial premises, is inadequate for new technologies and inhibits choice.

Austel said the new boundary would promote competition, while maintaining a customer's right to complete end-to-end service, including facilities, provided by Telecom under its universal service obligations.

AUSTRALIA ON THE LINE - FO
EXICON

John Kranenburg (left) with David Beddall and Bob Cruickshanks

NorTel and Exicom Sign Export Deal

NorTel has awarded a contract to Exicom to design, develop and manufacture a range of proprietary P-phones, which NorTel will market to customers in Canada and the US. The five-year contract has a committed first year value of $30 million.

The telephones will be manufactured at Exicom's production facility at Villawood, where the company already makes over one million phone sets each year for Telecom and network providers in countries in Asia, the Pacific and the Middle East.

The contract was announced by the Minister for Communications, the Hon. David Beddall, MP at a joint press conference in Melbourne last month. Mr Beddall said the contract epitomised Australia's most advantageous type of export trade, in that it involved a high degree of local R&D, domestic content and local manufacture.

NorTel's Managing Director, Australasia, John Kranenburg, said Exicom had been selected because of its extensive experience in the design and manufacture of telephones, high quality standards, and internationally competitive pricing.

Exicom CEO, Bob Cruickshanks, said the agreement has major strategic significance to the company, and would strengthen its position in developing future opportunities in domestic and offshore markets.

Exicom will set up a new internal division to service the contract, to be called Exicom NT, and will invest $2 million to extend and upgrade its production facilities, including a new state-of-the-art surface mount manufacturing line.

Telstra Raises $US300 Million

Despite recently having its credit rating lowered a notch by Moody's Investor Service, Telstra has successfully issued 10-year notes worth $US300 million into US debt markets. The issue was Telstra's first in the US market, although the company has been a frequent issuer in the European and Asian debt markets, according to Group Managing Director, Finance and Administration, Paul Rizzo.

Mr Rizzo said that demand was substantially in excess of the original $US200 million it intended to raise and a decision was taken to raise the issue by 50% as a consequence. Telstra CEO, Frank Blount, and Chairman, David Hoare, recently conducted presentations in major US centres to promote the issue.

Moody's decision to lower its rating of $2.4 billion of Telstra's long-term Australian debt one notch to Aa2 followed an appraisal of the market impact of Optus. The change affects 39% of Telstra's debts of $6.15 billion and is in contrast to Standard & Poor's decision in June to maintain Telstra's AAA Australian dollar debt rating.

GSM Interference to be Studied

The Minister for Communications, the Hon. David Beddall, MP, has set up a working party to examine the effects of radiofrequency emissions on electronic equipment, with the aim of seeking improvements in immunity from interference.

The investigation will be undertaken by a Radiocommunications Consultative Council (RCC) working party, under the supervision of the newly-formed Spectrum Management Agency.

Mr Beddall said that he attached a high priority to the study, which would incorporate a special task group to examine the effects of GSM telephones on hearing aids, and to identify ways to minimise any interference to their operation.

"Development of digital services will continue," said Mr Beddall, "but full consideration will be given to the problems of hearing aid users."

He said the Government was anxious to ensure that the quality of life for all Australians, including those with hearing impairments, was not diminished but enhanced by communications developments.

The working party will also consider appropriate standards for various types of electronic equipment to improve immunity from interference. Its report is due in September 1993.

Jtec in the Multimedia Big League

Sydney-based Jtec was the only Australian company invited to join the June 30 inaugural meeting of the Multimedia Communications Community of Interest (MCCOI) held in La Napoule, France. The ISDN equipment manufacturer was invited to the meeting by founding MCCOI member Telstra.

The MCCOI is an international body established to develop internetworking standards for PC-based multimedia communications. Members include France Telecom, Deutsche Telekom, BT, IBM, Intel, Telstra, BT and Northern Telecom.

Members have pledged to work toward the establishment of open standards for multimedia internetworking and the development of universal functionality for desktop applications by adherence to an internationally recognised API.

Warwick Smith Appointed TIO

Former Opposition spokesman on communications, Warwick Smith, has been appointed Telecommunications Industry Ombudsman (TIO). Smith was reportedly chosen from among 100 applicants for the position, which involves resolving customer disputes with the carriers.

The result of a deal hammered out by the Federal Government and the Australian Democrats before the last election, the TIO's office will be based in Melbourne and be administered by the carriers.

The former Deputy Prime Minister, Lionel Bowen, was appointed Chairman of the TIO Council earlier this year.

Mansfield Calls For Decorum

Optus CEO, Bob Mansfield, last month called for the Melbourne preselection ballot campaign to be held in a more informative way. "There has been a lot of hype and hoopla surrounding the earlier phone ballots — I sincerely hope the Melbourne ballot will be less emotional," he said.

The Melbourne preselection ballot began on September 1, with most customers in the '03' calling area being asked to select their preferred long distance carrier. Ballots in the nearby Geelong and the Mornington areas will start on October 4. Optus has blamed Telecom for refusing to have all three ballots commence on the same day.

In Brief

SynOptics has awarded Datacraft its first Authorised Customer Service Partner accreditation outside of the US. The accreditation is the highest level of technical certification available to a SynOptics products reseller and network service provider.

Austel has made public the Access Agreement between Telecom and Optus, which sets out the terms and conditions by which the two carriers access each others' networks. The document is available at a cost of $50. Enquiries can be made on (03) 828 7415.

Datacraft is to relocate its R&D operations to its new complex in the Melbourne suburb of Mooroolbark. The move will take place in June 1995, and involves transferring up to 30 senior staff and equipment from the existing R&D facility in Western Australia.

Infonet Services has changed its name to SingCom (Australia).

Oz-E-Mail, an Australian owned and developed public e-mail service, is to be used by the WorkCover Authority to link it to hazardous chemical sites contained in its SCID database.

The Siemon Company, a Connecticut-based manufacturer of fibre and copper cable termination, connection and testing equipment, has announced the establishment of its first Australian office in the Sydney suburb of Brookvale.

The Commonwealth Bank has chosen Siemens Nixdorf to supply a new Intelligent Programmable Gateway (IPG) which will connect branch offices to devices such as automatic teller machines and EFT/POS terminals.

JNA Network Services will provide Australia Post with a critical access gateway between LANs using Telecom's Austpac and ISDN services. Design 2000 will supply the hardware.

AllNet Technologies has supplied the Australian Amway operation with a network comprising 100km of cabling at the company's new Castle Hill offices, to support voice and data communication between 400 staff and a network of over 100,000 distributorships.

Siemens has won a Telecom Export Endorsement Certificate for its Series 71 and Series 2000 MDF terminating equipment.

Consultel has been awarded a contract to design a secure international electronic network to service the 15 members of the Asia Pacific Economic Cooperation Group (APEC). The network hub will be based in Singapore.

Datacraft has sold its 500th Micom Marathon product to Dorevitch Pathology, a large Melbourne-based pathology lab which provides 24-hour service to hospitals and medical clinics.

ATUG '94 will be held at Melbourne's Exhibition Building and Conference Centre, after speculation that the show would have to be staged in Sydney due to lack of suitable facilities.

Microsoft has announced the resignation of Australian Managing Director, Gary Jackson. In a brief press statement, Mr Jackson cited rumours about law suits between himself and former employer Pyramid as the reason for his departure.

Scitec has been awarded 3Com system integrator status, and has won the right to market 3Com's full range of products, including the NETBuilder II RISC-based high performance router and high speed multi-LAN LinkBuilder 3GH third generation hub.

DCA has announced the opening of a new sales and support office in Sydney for customers in Australia and New Zealand.

AARNet's Technical Manager, Geoff Huston, has been elected to the post of Secretary of the Internet Society. Huston, who has managed AARNet since its establishment in 1989, will succeed inaugural Secretary Juergen Harms of Switzerland.

Telecom and Visa have launched the new VisaPhone global calling service, which allows Visa cardholders to charge local, long distance and international calls to their Visa accounts.

Metal Manufactures has announced it will continue to fund research into superconductivity by a team of scientists at the University of New South Wales until at least 1996.

IBM has opened its third Open Systems Centre (OSC) at its headquarters in West Pennant Hills in Sydney. The centre provides customers with demonstrations of open systems products.

In Brief

Germany has given the green light to a plan to privatise Deutsche Bundespost Telekom and its sister companies in the postal sector. Under the plan, the three related companies will become limited companies majority owned by a public independent institution.

Telecom Corporation of New Zealand has reported a 61.5% boost in pre-tax profits to $NZ118.2 million for the June quarter. Operating revenues were posted at $NZ597.5 million, little changed from the same quarter last year.

ETSI's new policy on intellectual property rights will not be implemented until at least July 1994. The policy will require that members sign an undertaking to declare a patent interest in technology within 180 days of the start of a standards process, or have the technology automatically licenced to other members.

ISDN products which gained British Approvals Board for Telecommunications approvals rose 800% in 1992. BT said 100 products received approval in March this year, compared with 12 at the end of 1991. Similar growth rates are expected in 1993/94.

Siemens is planning to establish a switching plant in Vietnam, where it has already sold almost 300,000 lines of EWSD. The Vietnamese PTT will manufacture around 70,000 lines a year at the plant, under licence to Siemens, which has recently also set up plants in Indonesia, Taiwan and China.

The EC is planning an ECU90 million project involving feasibility studies and pilot tests to stimulate the provision of advanced ISDN services like videoconferencing on a pan-European basis.

BT's new BT3 shares closed at £1.68 on their first day of trading, a rise of 18p on the day. A total of 188 million shares were traded, with over half the new shares going to existing shareholders.

Nokia is founding Nokia Mobile Phones Japan (NMPJ) in a joint venture with Japan's Mitsui. The new company will sell digital telephones in Japan, and will start trading in early 1994.

Mercury Communications is lead partner in a venture, called In-Flight Phone Europe (IFPE), which will operate Europe's first commercial digital in-flight air-to-ground telephone service. The service is due to be launched between the end of this year and 1995, and will operate on frequencies in the 1800MHz band.

BT has announced it will cut international ISDN prices from September 29. High quality imaging for videoconferencing will become 27% cheaper, at £735 for two hours, and the cost of sending 100 pages by Group 4 fax from the UK to France will drop by 10.5% to £3.80. BT has international ISDN routes to 18 countries.

The Russian Ministry of Communications is postponing the issuing of licences to companies wanting to develop international communications systems, as part of a move to stimulate the development of domestic communications infrastructure.

Central and Eastern Europe, including the former Soviet Union, need to spend between $US140.8 billion and $US221.2 billion to bring main lines per 100 head of population from 13.75 to 29.41 by the year 2000, according to a report by Prodata Partners.

Alcatel has been selected by BT to provide a broadband switching system to be used in a European trial of ATM technology.

AT&T has reported record quarterly profits, with net income for its second fiscal quarter of $US1.044 billion, compared with $US961 million for the same quarter last year. The company said the 3% growth in revenue was led by strong gains in network telecommunications systems, and financial services.

Ericsson has announced a contract with the Philippine Long Distance Telephone Company which covers the engineering, supply, installation and testing of cable networks in 22 exchange areas in metropolitan Manila. The contract is worth $US78 million.

Nokia has won a contract to supply Deutsche Bundespost Telekom with its Corporate Access System advanced voice and data business network. The network will be one of the largest of its kind in Europe, and will be opened to subscribers in 1994.

3Com has announced record fourth quarter (ending May 31, 1993) sales of $US167.5 million, and record earnings per share of $US0.40. The results represent and increase of 33% in sales and 11% on earnings per share over the same quarter last year.

NT Posts Loss; Sells STC Submarine

Alcatel Cable has bought STC Submarine Systems from Northern Telecom (NT) in a deal worth $US900 million. The sale of STC is part of a major restructuring drive by NT following its $US1.03 billion loss and 4% decline in revenues in the second quarter of 1993.

Northern Telecom President and CEO, Jean C. Monty, said the company's second quarter results had been "extremely disappointing and unacceptable." He claimed that a slump in sales of central office switching software was partially responsible for the poor result. The restructuring will cost $US940 million, and will include closing a number of facilities and the loss of 9% of its 60,000-strong worldwide workforce.

STC Submarine Systems has 1,200 staff and reported sales of around $US350 million in 1992. Its acquisition makes Alcatel Cable the world's largest manufacturer of undersea cable. (Telecom*europa*)

BT, MCI Cement New Alliance

BT and MCI Communications have announced they have executed their agreements to form an alliance to provide worldwide value added services. The agreements provide for the formation of a joint venture company and aggregate investment by BT of $US4.3 billion for a 20% stake in MCI.

Mr Chris Earnshaw, formerly BT's MD of Worldwide Networks, has been named CEO of the joint venture, and the companies confirmed that Northern Virginia has been selected as the site of the venture's worldwide headquarters.

New Asian Fibre Link Planned

Singapore Telecom, along with eight other carriers, has signed a Memorandum of Understanding to build an 11,000km fibre link in the Asia Pacific, called the Asia Pacific Cable Network.

The cable will link Singapore with Indonesia, Malaysia, Thailand, Hong Kong, Taiwan, Japan, the Philippines and Korea. The partners include Indosat, KDD, Hong Kong Telecom, Korea Telecom, PLDT, Telecom Malaysia, the Communications Authority of Thailand and Taiwan's International Telecommunication Development Corp. (Telecom*europa*)

France Telecom to be Privatised

The French Government has announced a major overhaul of the country's telecommunications sector, which will include making national operator France Telecom (FT) into a limited company with a maximum of 49% of shares floated. The privatisation and regulatory changes will be subject to debate in the French parliament next February.

FTs revenues grew 5.9% in the financial year 1992-93 to FFR112.6 billion. Annual profits, after payments to the state of around FFR15 billion, increased to FFR3.3 billion from FFR2.0 billion for 1992, while the number of employees was reduced from 156,100 to 155,300.

Voice telephony, facsimile and videotex accounted for 80% of business. The number of lines installed rose by 3.4% to 30 million, while fax traffic increased 36%, leased circuits increased from 39,000 up to 55,200, and Transpac X.25 accesses were up from 98,000 to 107,000. The growth in Minitel terminals remained fairly steady at 6.3%.

FT also recently announced plans to rebalance prices and to enlarge the area in which subscribers can call at local rates. The changes will reduce phone bills by an average of 2.4%, and result in a loss of revenue for FT of around FFR2 billion per year. (Telecom*europa*)

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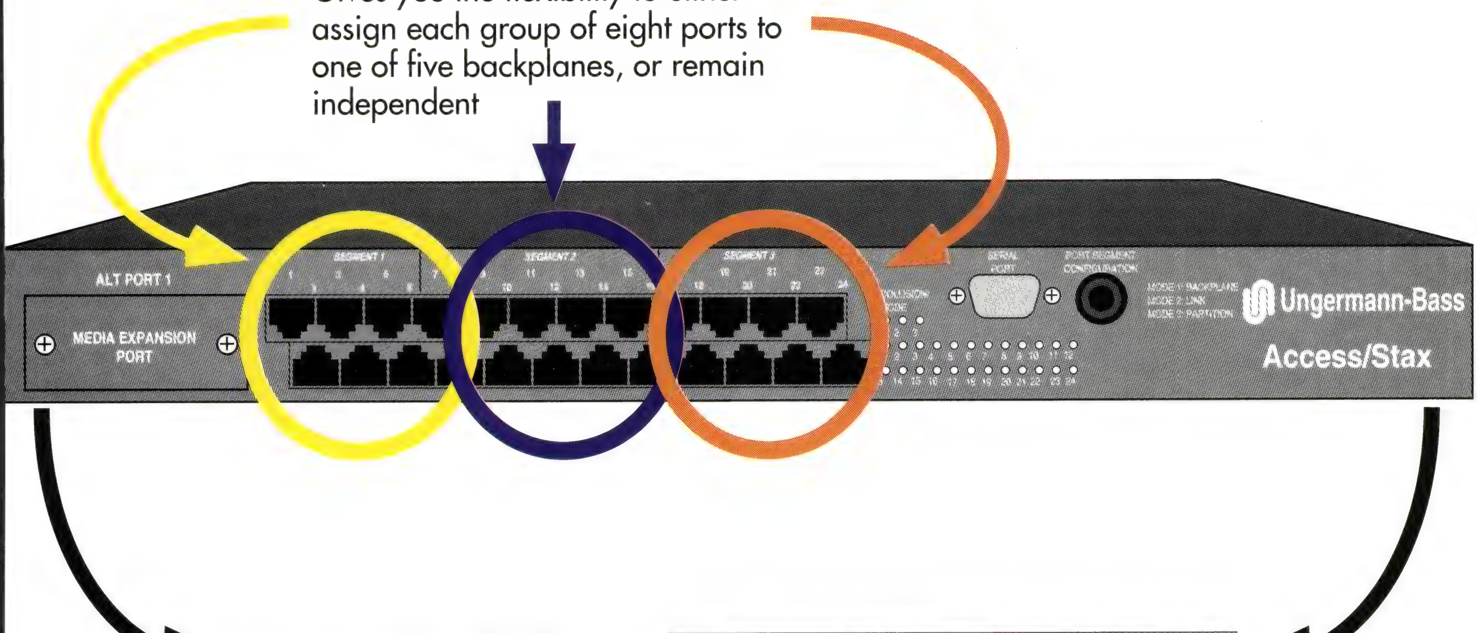

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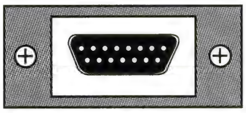
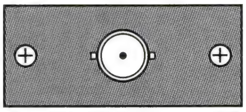
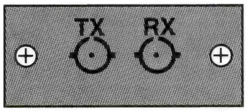
Optional Media Connectors



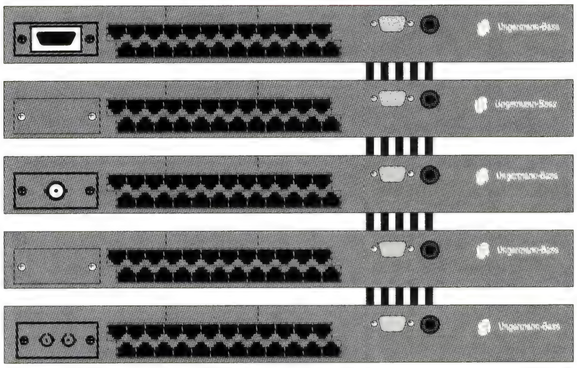
DB-15 connector AUI (Thicknet)



BNC connector for Thinnet



Fibre (FOIRL) connector



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Australian Communications — The Last Five Years

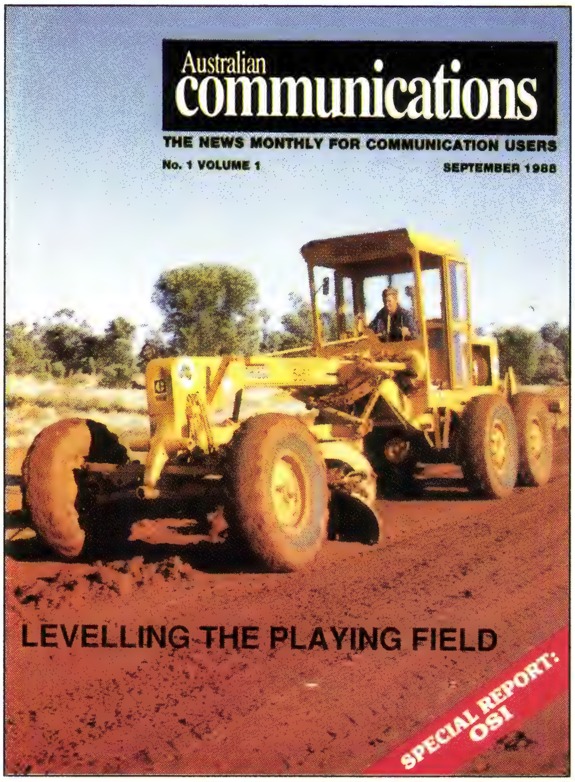
For a journalist, re-reading old copy is generally a deeply disturbing experience: How could I have been so ignorant? What does that paragraph mean? Why did I write-down to the readers like that? It's real cringe-creating stuff. So when I was asked to put together a piece on the last five years of this magazine I shuddered slightly at the thought.

Looking back through my files I see that the first article I wrote for *Australian Communications* was sometime in mid-1989, and the subject was the DPNSS (Digital Private Network Signalling Scheme for PABX-to-PABX) protocols. Mercifully, the copy has disappeared from my files, since I'm not into self-flagellation. The result, I well remember, was a completely incoherent article which made the most extraordinary statements. If the readers didn't understand the DPNSS article at the time, they can take heart from the fact that the writer didn't either! It took me a long time to recover from that experience.

This was the time when *Australian Communications* was nominally being produced in Sydney, but most of the sub-editing and compilation was being done in Melbourne by a random raft of sub-editors who thought the best way to cut technical copy was to join the first sentence of one paragraph to the last sentence of another — or even sometimes the beginning of one line with the end of another.

Thankfully, things have moved on.

SEPTEMBER 1988



An Early Start

Volume 1 No. 1 in September 1988 was not actually the first issue of *Australian Communications*; prior to the current series, the title had done the rounds for quite some time. It had been used variously for a four-page ATUG newsletter edited by Colin Rivers (in 1986), and later for a full colour magazine put together by Laurel Fox Allen and Stuart Corner (from November 1986). Kerry Packer's Consolidated Press then won the publishing rights through ATUG, and *Australian Communications* in its present form was born.

But *Australian Communications* was by no means the first (or only) title of its type in this country. I've also got almost the full set of Ian Reinecke's *Communications Australia* (Thompson Publications) from June 1982. It is fascinating to look back over these 'ancient' artifacts, and realise just how far we've come in a decade — and with *Australian Communications*, over the last five years.

In the 1982 Reinecke issue, the big story was 'The Davidson Inquiry,' which probably set the direction for our current telecommunications reforms — particularly the current ideas of competition and the need for an independent regulator. You'll be pleased to note that one key statement in the magazine's report reads: '[OTC's Neil] Tuckwell and Professor Tony Karbowiak, the technical expert on the inquiry, grappled over the distinction between basic and enhanced telecommunications services . . .' Obviously, the more things change, the more they stay the same.

Reinecke tended to steer away from discussing technologies in depth, in favour of a magazine which had a much more political and regulatory orientation. This was understandable; control of the supposedly rampant Telecom was the big news in 1982, and there wasn't a financially-viable pool of potential technical readers outside the confines of Telecom itself.

Five years later, when the present run of *Australian Communications* began, the magazines were already introducing some of the technical ideas, acronyms and terms that we are quite familiar with today. And there's the normal mix of hype, infinite extrapolation and bullshit that we all know and love in this industry.

One article talks about LANs (Was this the first 'Year of the LAN'?), packets, fast-switching and FDDI. It's surprising to find how long FDDI has been in vogue. In fact FDDI appears to have become an obsession with magazine writers — it seems to figure in virtually every issue up to the present. Yet it is a rather esoteric technology in Australia, and appears to be used by almost no-one.

Higher and higher data-rates have long been part of the culture, and the need for them is now conventional wisdom. In this early article there is also the prediction that future optical multiplexers would soon be handling 10,000Gbps of bandwidth. Obviously think-of-a-number-and-add-a-couple-of-zeros was all the rage in the '80s also: it has long been the technical magazine's answer to the Page Three Girl.

The then editor, Luis Huesch, was running true to form in this first issue, letting loose with both barrels against the politicians and Telecom. His piece is headed by the (now) cliched 'How to establish a level playing field,' and he is earnestly advising the new Communications Minister, Ralph Willis, 'to freeze Telecom's expansionism while he sets up Austel as priority one.' There's also a lot of talk about the growing importance of OSI and GOSIP, and a piece from Stuart Corner explaining X.400. PABX maintenance contracts were also a big deal in those days.

AUGUST 1989

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communications
AUGUST 1989/$4.95
ISDN
At the bottom of your garden and delivering voice, data, image . . .
SNA VIA TOKEN RING
A square peg in a round hole?
AUSTEL
A new era dawns
TCP/IP
Six PC solutions revealed

By 1988, when the current series started, Austel, Davidson's recommended regulator, had become a reality — in theory, anyway, if not actually in practice.

Media lawyer Peter Leonard appears right from Issue 1 examining telecommunications law, a subject that seems to have occupied much of the attention of the industry around this time, probably because the government was writing the new telecoms legislation.

Moving With the Times

The most obvious changes in style and content date from about August 1989. I should be able to win brown-nose brownie-points from the current editor/publisher Mr Mark Smeaton Esq. (tugs forelock!), by pointing out that this was about the time that he came on board as editor.

Overnight the magazine increased in size, acquired good quality paper suitable for colour printing throughout, and boasted some professional design in the covers and in the general layout. What's even more important (from a personal financial perspective) it acquired me as a freelance writer once again. Thank God Mark hadn't got around to reading my DPNSS piece in the back issues!

The most interesting story (from today's perspective) towards the end of 1989 is Kester Cranswick's News Analysis piece headed 'Telecom profit approaches $1 billion.' Kester has Senator Richard Alston, the Liberal shadow minister, claiming that 'the real profit figure was $1.5 billion' and calling for cuts in the price of Telecom services. 'STD rates are double what they ought to be, and local call rates are the highest in the world,' he complains.

Wally Rothwell agreed: 'For Telecom to announce a $15 increase in installation charges at virtually the same time that it announced a record profit is appalling timing, let alone an unnecessary impost,' he complained bitterly.

From a future-history perspective, probably the most significant story that year was a small piece in August 1989, 'Telecom puts VAS on a corporate footing.' It is a short article about the launch of Telecom Plus into the Value Added Service business. This was Telecom's first fully 'commercial' venture on a competitive basis, and it set the scene for the infrastructure pipeline supplier to move from the plumbing business into high-level services.

Tom Amos and I seem to have been writing in parallel during these early years. The month that I did a piece on EFTPOS, so did he (or is it the other way around?) and the month he questioned the value of ISDN, so did I. Interestingly, the August 1989 pieces from both Tom and myself on ISDN still stand up pretty well. We were both predicting a rather subdued business enthusiasm for ISDN, and this has certainly been true.

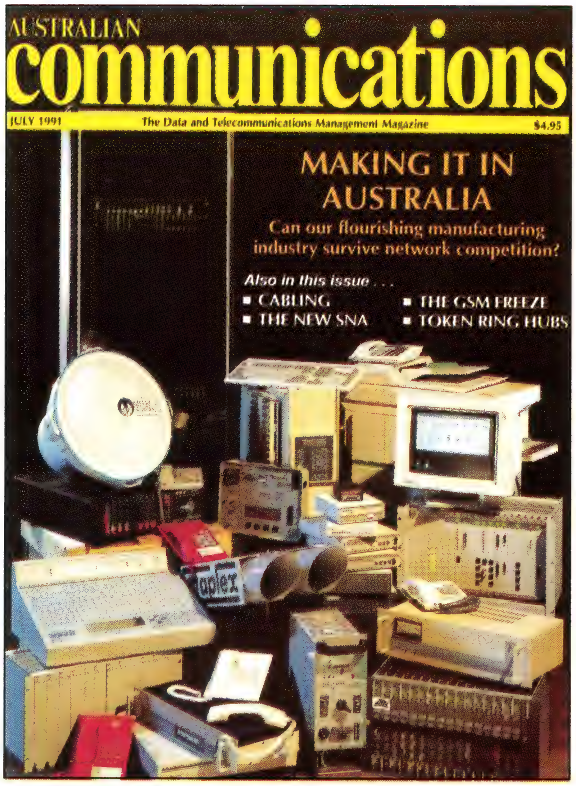
In September 1989, the main interest in the industry seemed to have shifted to the new mobile services. Minister Ros Kelly was talking about an Austel inquiry into CT-2 and CMTS (an acronym which has already virtually disappeared from use), and Maurie Dobbin had a good article looking at the implications of competition in the CMTS area.

From 1990 on, the magazine appears to have assumed roughly the subject span and style that we see today. It has extended very much further out from the core telecommunications subjects; particularly into LAN and WAN technologies.

In these last few years, there's also been a subtle shift in the way telecommunications terminology is defined. It is hard to put your finger on when this actually happened, but instead of discussing X.25 packet-switching, we writers start to use the Telecom/OTC tradenames like Austpac and Austpac Commercial, Minerva, Data Access, and then Tran$end. These are all X.25 services, probably all using identical technologies, but differing only in the name at the top of the bill (and the amount being billed) — but we often fell into the trap of discussing these 'services' as if they were different networks using different base technologies. It's always been the cause of much confusion in this industry.

This is only one of the traps that technical journalism has fallen into over the last few years, and most are probably the result of the

JULY 1991



growing complexity and range of what we are being asked to cover. It is often impossible to find out exactly what is being sold as a 'service.' What does 'virtual' (as in virtual private network) really mean? Computers, communications, multimedia and broadcasting systems are all merging, and technical information is now hiding behind a plethora of service and cobbled-up technical names.

I would guess that this trend in service-confusion follows the worldwide pattern of corporatisation of the monopoly carriers, and the progressive moves towards competition. With this economic-rationalist approach, there's been the inevitable shift of emphasis from excellence in engineering, to full-force flamboyant marketing.

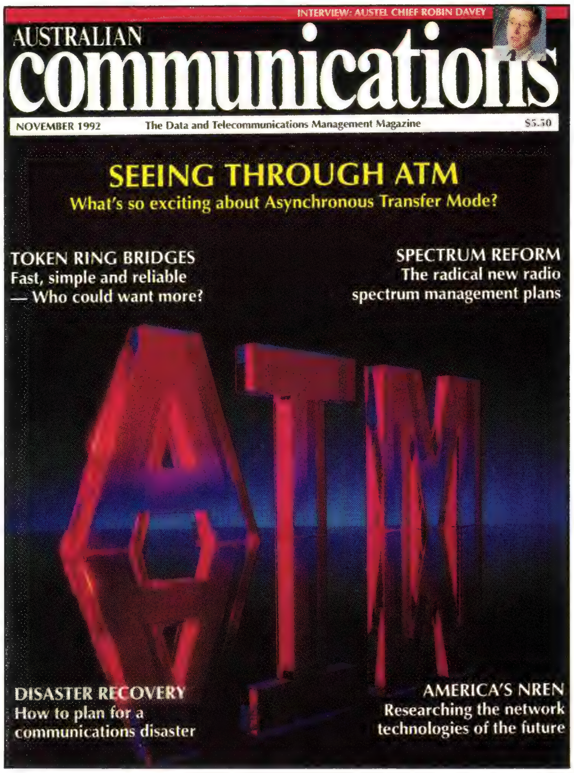
So we now seem to have a multiplicity of names for services which are often no more tangible than billing plans. And, while this may be acceptable for soap-powder manufacturers and purveyors of pet-rocks, it's not necessarily desirable for a monopoly (in most areas) national infrastructure provider.

Technologies, New and Old

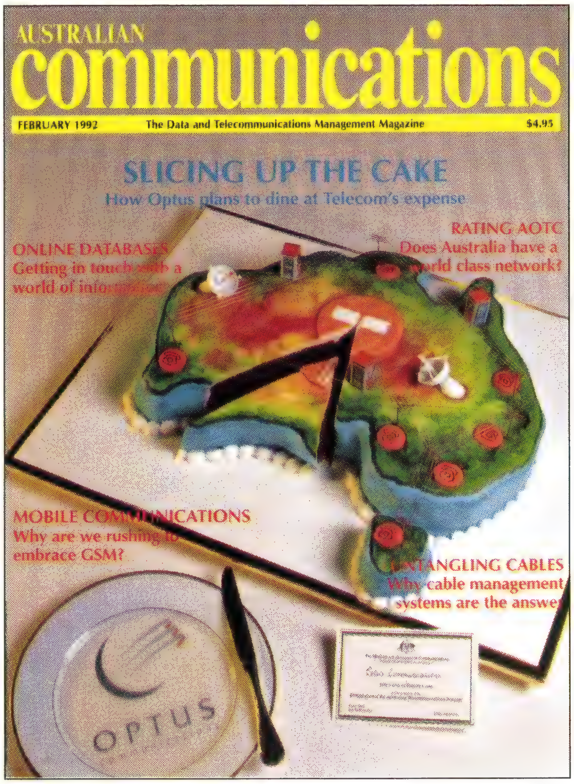
In the last few years, many of the core articles in the magazine have been about the future technologies that are said to be on the verge of revolutionising telecommunications — QPSX/DQDB, SDH (Synchronous Digital Hierarchy) and ATM (Asynchronous Transfer Mode) and, of course, B-ISDN (Broadband ISDN) over optical fibre, in the streets, and to the home. This is always the most interesting stuff for a journalist or technical expert to write about. Who wants to write about boring old subjects like Telex or e-mail, when you can play the guru and philosophise about High-Definition Virtual-Reality streams distributed over twisted pair. The fact that Telex is still a mainstay of many important international industries, and e-mail is probably the most productive technology we have, is beside the point!

If you want a prediction about what the next five years will have to offer, I'll stick my neck out and say that all of the super-technologies listed above will become increasingly irrelevant (with the possible exception of ATM). SDH only means something to the carriers, and is not of much importance to users, while both the B-ISDN and Fibre-to-the-Home concepts, are, I think, seriously in doubt — at least until well into the next century.

NOVEMBER 1992


INTERVIEW: AUSTEL CHIEF ROBIN DAVEY
AUSTRALIAN
communications
NOVEMBER 1992
The Data and Telecommunications Management Magazine
$5.50
SEEING THROUGH ATM
What's so exciting about Asynchronous Transfer Mode?
TOKEN RING BRIDGES
Fast, simple and reliable — Who could want more?
SPECTRUM REFORM
The radical new radio spectrum management plans
ATM
DISASTER RECOVERY
How to plan for a communications disaster
AMERICA'S NREN
Researching the network technologies of the future

FEBRUARY 1992


AUSTRALIAN
communications
FEBRUARY 1992
The Data and Telecommunications Management Magazine
$4.95
SLICING UP THE CAKE
How Optus plans to dine at Telecom's expense
ONLINE DATABASES
Getting in touch with a world of information
RATING AOTC
Does Australia have a world class network?
MOBILE COMMUNICATIONS
Why are we rushing to embrace GSM?
UNTANGLING CABLES
Why cable management systems are the answer
OPTUS

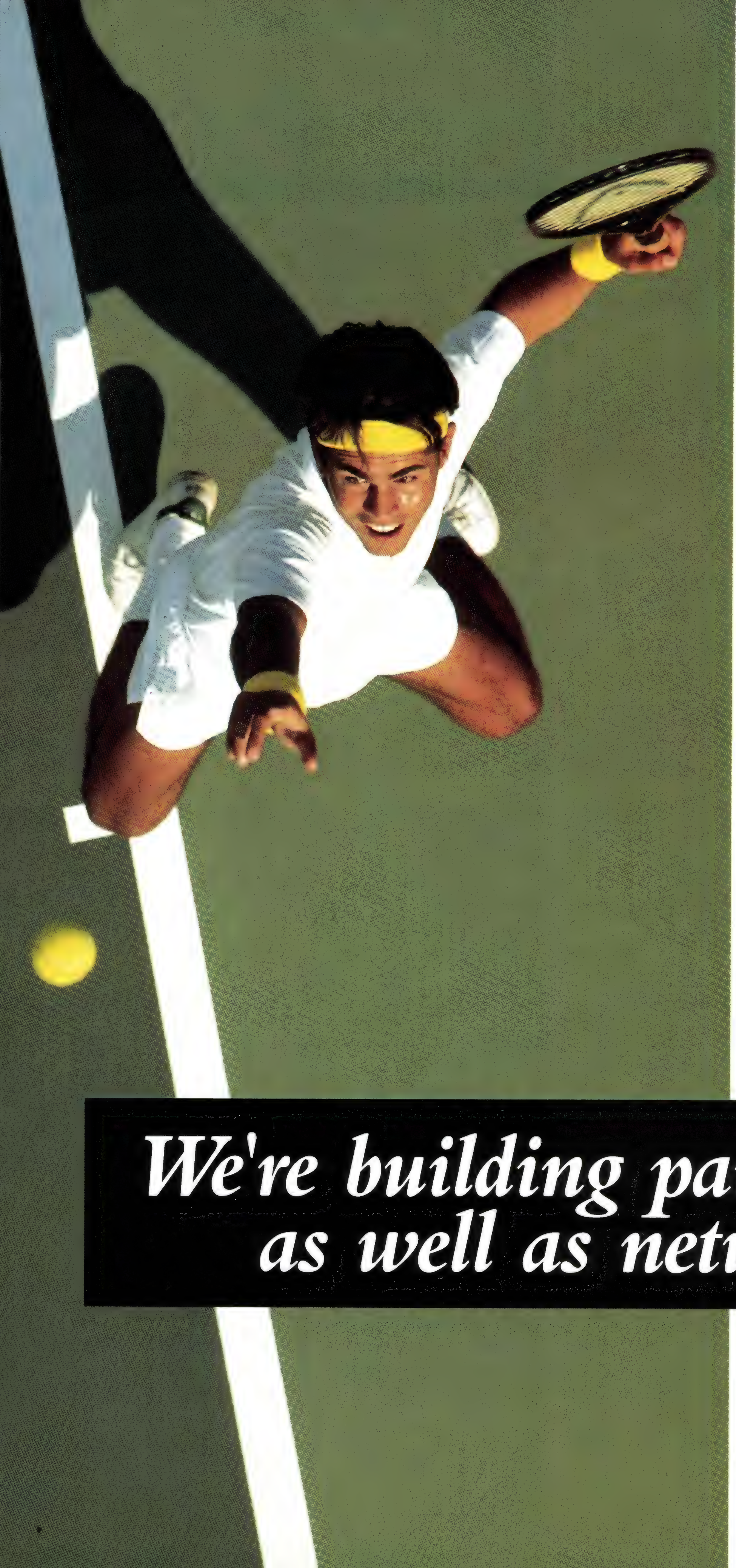
The problem here is how much the editors and writers of this magazine act as 'gatekeepers' and let their opinions influence the selection and tone of articles, especially when they depart from the conventional wisdom of the day. Generally (and fortunately) magazines have space for a range of different views, so there's usually a good spread of opinion, and a reasonable balance.

But, to a degree, these niche magazines should be in the business of creating controversy and helping to reset the public agenda. For instance, I suspect that we are seeing a change from an emphasis on glass fibre for local delivery, back to radio-based systems — not just for the mobility radio links gives us, but also for cost-saving. Expect to read a lot more about these technologies in the future, not just for cellular voice and data and wireless LANs, but for wireline local-loop replacement and television broadcasting as well.

Australian Communication will, of course, continue to follow very closely technologies like frame relay, Ethernet, Token Ring and SNA. Like Cobol, it is hard to dispense with antiquated protocols which have served us so well — even if they do cause programmers and LAN managers to tear their hair out in frustration.

And, while we may despair at pricing policies for the present, just remember that a year from now the ballot and the neurological saturation bombardment on television will just be a fading echo of the past. The prices of STD, IDD, Megalinks, and mobile calls will probably have risen once again to reflect 'unpredictable changes' in international economics, and Telecom/AOTC/Telstra will probably be contemplating another name change to 'PMT Enterprises,' and buying up MacDonald's concessions in the Philippines.

Stewart Fist is a freelance journalist, and has been a regular contributor to Australian Communications over the last five years.



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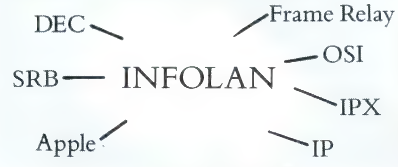

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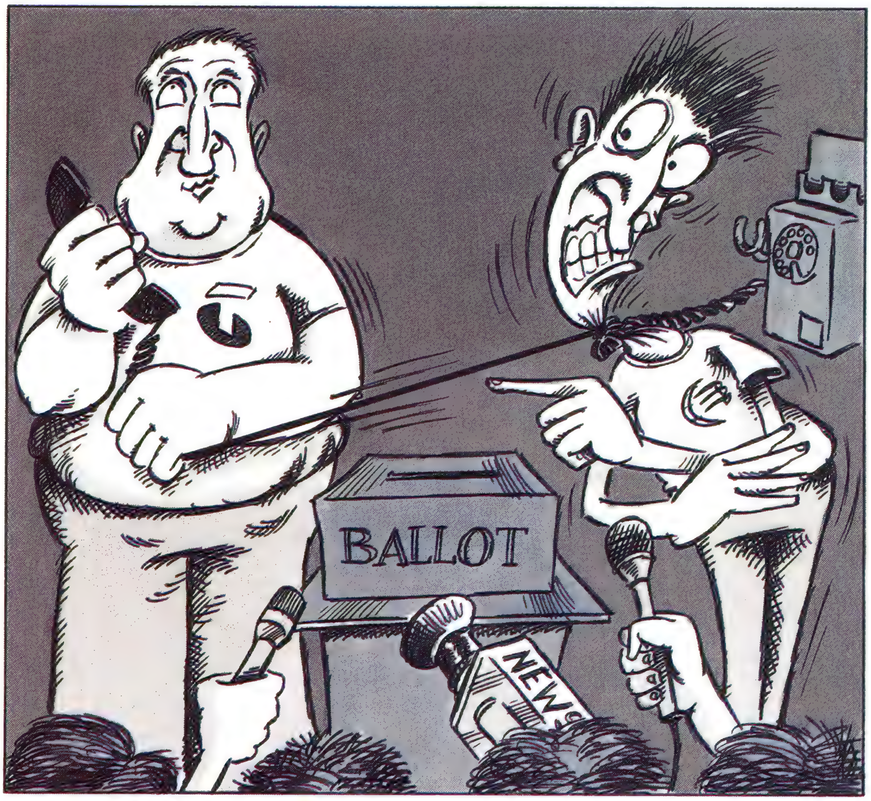
Optus Chokes on Lost Calls

When does prudence give way to the demands of PR? Optus' timing and handling of its 'lost' Canberra calls claim may be a good example.



As this edition of *Australian Communications* went to press Telecom sources were saying that, with less than 10 of the allotted 30 days remaining, response from Canberra telephone customers to the preselection ballot was not looking particularly good for Optus. The second carrier was said to be heading for an 8% market share gained from a 40% response to the ballot.

If this was correct, then Optus' high profile 'lost calls' publicity stunt will have achieved nothing except to seriously sour, perhaps irrevocably, relationships between the two carriers. While the two had previously indulged in mild slanging matches as part of their PR campaigns, the relationship at an engineering level was generally said to be very good. Indeed, Optus CEO, Bob Mansfield, had on more than one occasion praised the professionalism and cooperativeness of Telecom staff working in the critical areas of implementing and maintaining the interconnection between the two networks.

All that, according to some observers, came to an end on Monday July 11, when Optus hurriedly convened a press conference in Canberra to announce that Telecom was 'losing' as many as 80% of its international calls out of Canberra. When first alerted to the problem, Optus, instead of consulting Telecom and trying to resolve the matter amicably (although accounts here differ), hired consultants Amos Aked Swift to place more than 40,000 STD and IDD test calls over the Optus and Telecom networks from telephones around the country in order to quantify the magnitude of the loss.

As a result of this exercise, Optus claimed to have good evidence that large numbers of calls were not even being presented to its international gateway in Canberra. Similar problems (rumoured to be of a greater magnitude) were experienced in other areas, according to Optus, but for PR purposes it focused on Canberra. Caught on the hop, Telecom's PR machine appeared to go into panic mode.

After initially denying any responsibility for the loss, Telecom's Group Managing Director, Networks and Technology, Doug Campbell, was quoted (or misquoted) in the *Australian Financial Review* as follows: 'Asked if Telecom knew that calls were being lost, Mr Campbell said 'sure, but we did not think it was our business to tell them. That was what we asked for so we left it at that'.' According to the AFR, Telecom CEO, Frank Blount, publicly reprimanded Campbell for his remarks saying "those comments were not cleared by me." *Australian Communications* has been unable to verify the accuracy of the AFR's report because Telecom refuses to make further comment.

Austel Confused?

After publication of the results of an Austel investigation into the matter, it disappeared entirely from the news. Austel made a 'preliminary finding on the basis of the information received to date.' It concluded that:

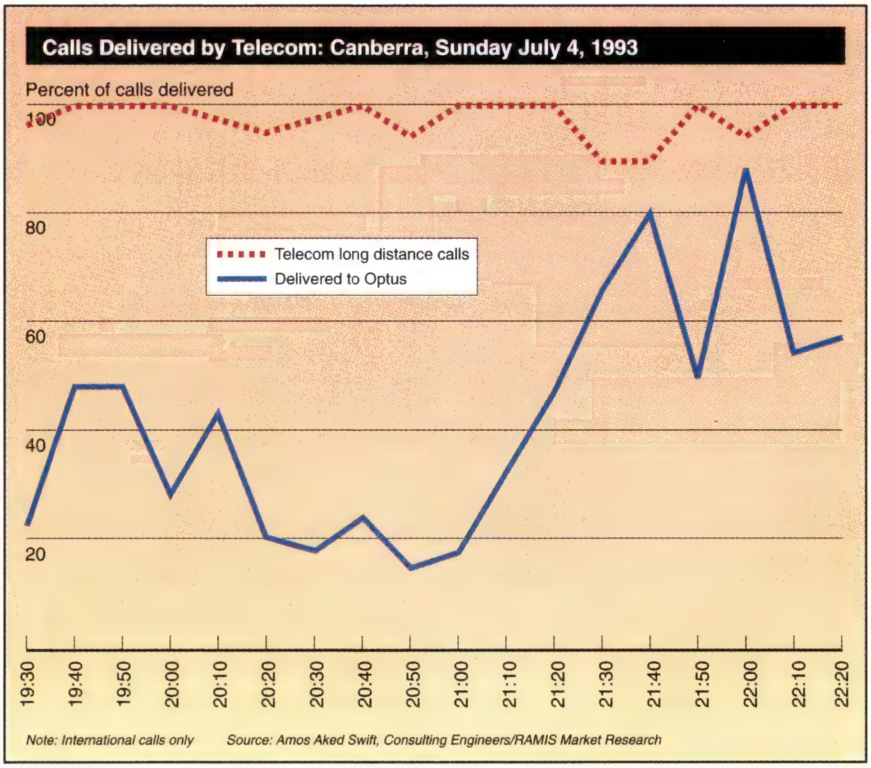
a) 'Call congestion (i.e. lost Optus calls) occurred particularly at certain off-peak tariff periods when unexpectedly high call traffic levels were generated by Telecom and Optus marketing initiatives.'

b) Both Telecom and Optus are responsible for the problem; and

c) The call congestion appears to have been caused by a combination of factors including: Telecom inadequately balancing the distribution of Optus traffic between Telecom's gateways; Optus having inadequate capacity between its own long-distance switch and the Telecom local network to accommodate high traffic levels generated by Optus' marketing (more recent initiatives by Optus have addressed this issue); Optus not having taken steps to establish alternative access or overflow facilities for handling such high traffic overloads.

According to Optus, this conclusion failed to address Optus' claim that as many as 75% of calls were being lost at times when there was no congestion. In his response to the Austel report Optus CEO, Bob Mansfield, said "The unfortunate aspect of the Austel report is that it confuses two quite distinct matters: the loss of calls in the Telecom network and congestion on the Optus network. The latter we know about and are perfectly capable of dealing with, and in fact have done so."

It is most unusual for Austel, which is as a rule extremely precise and analytical in all its investigations, to gloss over the distinction between lost calls and congestion with a pair of parentheses, as in a) above; 'Call congestion (i.e. lost Optus calls) occurred particularly at . . .' If there is congestion, calls would be presented to the Optus net-


Calls Delivered by Telecom: Canberra, Sunday July 4, 1993

Note: International calls only Source: Amos Aked Swift, Consulting Engineers/RAMIS Market Research

work at the point of interconnect. Optus would be unable to deliver them but would, presumably, be able to register them.

Congestion Management

Given the black hole into which the whole affair has disappeared and the technical complexities of telecommunications networks and their management, the whole truth may never become public. However, there is strong evidence to suggest that if there was congestion at the point of interconnect, it would be standard network management policy to prevent many incoming calls from ever reaching that point of interconnect. They would be deliberately 'choked,' not 'lost,' and unless informed by Telecom, Optus would be unaware of the true level of demand on its network.

Technical articles published by Telecom in a bygone era of pre-competitive openness (only five years ago) provide some revealing insights. The *Telecommunications Journal of Australia* (TJA), Vol 38, No 1, 1988 carried a series of articles on management of the Telecom network.

These articles make clear that when Telecom detects congestion at the gateway to an interconnected network (in this case OTC's international network) if it continued to deliver all incoming calls to that gateway, there could be detrimental effects on Telecom's own network. 'Under (congestion) conditions exchange switching equipment is heavily utilised trying to process outgoing calls, many of which have little chance of success, and so (the switch) cannot terminate incoming calls which are more likely to succeed, being nearer completion. Traffic with a good success rate must compete with 'bad' traffic for access to network resources and so the success rate of all traffic is affected. As a result, network performance rapidly deteriorates and a network overload can occur.'

Elsewhere TJA explained how calls are 'choked' as near to their point of origin as possible. 'An undesirably large increase in ineffective attempts which exceeds the engineered capacity of the exchange can result in switching congestion. If this congestion is left uncontrolled, it can be reflected back into other parts of the network, causing the congestion problem to be more widespread.'

Controls should be applied which inhibit switching congestion, by removing ineffective attempts from the congested switching machine. 'Ideally such action should be taken as near as possible to the source of the traffic; this approach leaves more circuits available to carry a greater proportion of successful calls while preventing calls from spreading to other parts of the network.'

The journal article identifies two distinct strategies to achieve this goal: expansive and protective. Expansive strategies allow traffic with a high likelihood of success to be redirected away from congested areas onto lightly loaded routes in the network, thus providing, temporarily, an extra alternative route for the traffic.

Protective strategies prevent traffic that has a low success rate from getting access to the network, leaving more capacity for calls with a high success rate.

'Protective strategies are used for the international destination traffic because all traffic must pass through the OTC gateway (in Sydney) making call redirection and hence expansive strategies impossible. The aim of these strategies is to protect Sydney's main exchanges as well as the OTC Gateway from overload.'

This is very similar to the present situation in Canberra except that Optus has two international gateways, but it is not clear what agreements Telecom had with Optus on routing of traffic to these gateways. However, it is clear that with only one or two access points, in the event of congestion Telecom would be likely to adopt protective strategies to protect its own network from overload.

Lost or Choked?

The result would be that, unless there was some other communication between the two organisations, Optus would be unaware of the true level of demand on its network because a percentage of calls would have been 'choked,' not lost, in the Telecom network. This percentage could be very high. One of the TJA articles described the trial of an expert system over Christmas 1986 (a time of high congestion). It said that with a 30% congestion level the system recommended a choke rate of 98% (i.e. only 2% of calls allowed through to the gateway) on traffic to the UK, the most popular destination.

This choke rate is not immediately cancelled when congestion eases. It takes time for operators to respond. The article noted that the expert systems performed better than human operators 'during the building up and falling off of congestion.' Network management may well have evolved considerably in the past four years, but it is clear that if there was congestion in its network, which Optus admits to being the case, it would be standard practice for Telecom to prevent a fair proportion of incoming calls from ever reaching that network.

What is more, one would expect that Optus, as a carrier itself, would be well aware of this practice, and if calls were being 'lost' at times of high demand would have identified 'choking' as the most likely cause and made enquiries of Telecom to see if this was the case and, if so, to what extent. The real issue is: what agreements did the two carriers have regarding how Telecom was to act in such a situation, and how it was to communicate to Optus?

In Austel's report, Robin Davey hinted that such lack of communication may have been at the root of the problem: 'If established procedures had been adhered to, the problem would have been resolved without the attendant publicity and consumer uncertainty . . . We are disappointed at the way the issue was brought to light and at the apparent lack of communication and co-ordination on both sides.' Perhaps this is simply what happens when marketing people and not engineers are running the show.

Stuart Corner is the Editor of Exchange.

GSM

GSM: The Story Continues

Like it or not, 'immunity' is a word the Australian telecommunications and electronic/electrical equipment industries are destined to hear more frequently in the wake of the latest deliberations on the health, safety and interference problems associated with GSM.

The 'I' word has been high on the agenda of two working groups of the Radiocommunications Consultative Committee (RCC), under the aegis of the Spectrum Management Agency (SMA), which have been set up to broadly examine electromagnetic interference (EMI), and, more specifically, the issue of EMI on hearing aids.

The result will almost inevitably be new Electromagnetic Compatibility (EMC) standards for a entire raft of products — from hearing aids to motor vehicle computers, heart pacemakers and domestic audio gear— that never required such high levels of immunity before now, or at least before the introduction of GSM mobile services.

The significance of the RCC deliberations is that they were ordered by the Minister for Communications, David Beddall, following pressure from several hearing-impaired groups on Telecom Australia, Austel, the Department of Transport and Communications (DOTAC) and the Department of Industry, Technology and Regional Development (DITARD). Beddall's entry means that the GSM interference question and related health issues are now well and truly in the public (that is, political) domain.

The first and most powerful of the two RCC working groups will look at the total issue of EMI, and will seek to make recommendation on electromagnetic compliance (EMC). The group will include representatives from Austel, which approved GSM as the preferred second-generation mobiles technology in 1990, Telecom, Optus and Vodafone; telecommunications equipment manufacturers and suppliers; the Australian Telecommunications Users Group (ATUG); the Radiocommunications Users Association; the Radio Site Owners and Operators Association; the Attorney General's Department; the Department of Health, Housing, Local Government and Community Services; the Australian Electrical and Electronic Manufacturers Association (AEEMA); the Australian Information Industry Association (AIIA); the Communication Workers Union (CWU); the Telecommunications Consumers Network (CTN); the CSIRO; DOTAC; and DITARD. It will be chaired by Christine Goode, with a report to be delivered to David Beddall sometime this month.

The second working group, which will report to the main RCC task force, will look at the specific issue of GSM and hearing aids. It will comprise representatives from the Deafness Forum of Australia, the Consumers' Telecommunications Network, the NSW Deafness Council, Australian Hearing Services (AHS) and delegates from other commercial hearing aid manufacturers.

Delayed Introduction?

So, is the introduction of GSM threatened as a result of the interference/health concerns? Not likely, as a press statement from Communications Minister David Beddall's office makes clear. 'The communications industry, with the support of government, has made a substantial commitment to the introduction of digital mobile telephones into Australia, and these services have already begun operation. Development of digital services will continue, but full consideration will be given to the problems of hearing aid users.'

DOTAC's Executive Manager, EMI Projects and Standards Policy, Neil Primrose, says that while there are plenty of standards for emissions from transmitters, there are almost none for receiving devices like hearing aids. He says that because so much new TDMA-based technology is emerging, the hearing aid issue would have had to be addressed regardless of the advent of GSM.

The European Community, through the European Telecommunications Standards Institute (ETSI), has adopted EMC standards which will be in place by 1996, and Primrose says it's 'desirable' that Australia align itself with these standards.

Meanwhile, ATUG's Executive Director, Wally Rothwell, says ATUG would have to be convinced that any problems were life-threatening before calling for the suspension of GSM's introduction. 'The fact is, GSM is just too far down the road to turn back now,' he said.

Interference Issues

Exactly what kinds of equipment is affected by GSM interference? A senior electronics engineer with one of Australia's four major banks, who heads a team of about a dozen assigned to examining all telecommunications and data communications equipment, demonstrated to *Australian Communications* how a GSM handset could knock out a credit authorisation terminal (CAT) at a distance of three metres. One of scores of different brands used for retail and merchant credit authorisation, the CAT, with a plastic cover, produced the message 'unreadable card' on its screen once the GSM handset was activated nearby.

According to the engineer, any device with a card reader can be taken out by a GSM handset, unless it has a metal shield, and even then, if the handset is close enough, there can be other kinds of interference.

"There are a whole range of EFT/POS terminals out there, tens of thousands of them in retail outlets like Woolworths, Coles, Myer and so on, and they're all in danger because they have plastic covers."

He also quoted the case of a Ford motor vehicle whose computer flashed up a screen filled with 8s and needed to be re-booted.

He says personal computers themselves are not much at risk in standalone situations, but are vulnerable in LAN configurations where they are linked with unshielded twisted pair or coaxial copper cabling.

A NSW-based telecommunications consultant who spends his days touring the State fixing problems at computer sites of all sizes, describes Telecom as 'hypersensitive' about the GSM interference issue.

"They're not so much fussed about interference itself; they're more worried about being sued by hearing-impaired people or other groups who may be affected," the source says. "In truth, they're quite bloody-minded. Their attitude is basically: it's your problem." However, the Human Rights and Equal Opportunities Commission has made it clear to the carriers, Austel and hearing impaired groups that legal action is possible under the *Disability Discrimination Act.*

As if the interference problem were not enough, there is also some speculation as to whether GSM is capable of delivering capacity increases of three to four times that of analogue. Optus defends GSM's promise: "Our experience in building and operating a GSM network is that it will fully meet the spectral efficiency criteria that it was designed to," said Martin Farrimond, Optus' Manager, GSM Product Development.

Optus also says that when Phase 2 of GSM is implemented, half rate coding will act to double spectral efficiency from eight time slots to 16 time slots.

Farrimond describes GSM as "the catalyst for action" on EMI/EMC. "As an industry, we should be seeking a compromise between all technologies so that they can co-exist, and the RCC Task Force must look into this," he says.

"We won our licence largely on the basis of adopting GSM technology, and we see GSM as the best platform for Personal Communications Services and Networks (PCS/PCN). But as the second carrier, we are looking beyond the next 12 to 24 months. We are continuously reviewing how GSM will develop. There is a planning group within Optus that is looking at market needs five years ahead. GSM is a complete network solution and we believe our customers' needs will be best met by *not* changing the technology every 10 years."

Hearing Problems

On the hearing aid issue, the three carriers have committed themselves to providing human resources and testing facilities valued at $300,000 over the next 12 months.

According to Ken Joyner, who heads Telecom's Electromagnetic Compatibility Section, Telecom's contribution to the hearing aid testing program with the AHS's National Acoustic Laboratories (NAL) so far has been to give more than six man-weeks in labour.

Joyner accepts that there are wider problems such as interference with electronic equipment like PCs and modems, vehicle computers and domestic goods. But he describes most news media reports as "a lot of folklore," especially when it comes to GSM handsets triggering car airbags and disabling engine management systems such as cruise control and anti-lock brakes.

A leading commercial hearing aid manufacturer and member of the Hearing Aid Council of Australia, Phonak Australasia, is saying what the local telecommunications industry least wants to hear — that manufacturers and operators of GSM technology should contribute financially and otherwise to raising immunity levels in affected electronic equipment.

Phonak's CEO, Manufacturing and Marketing, Marshall Smither, says: "From my point of view as a manufacturer and an advocate for the hearing-impaired people of Australia, it's a fairly straightforward argument that if you, as the commercial manufacturer of these telephone devices, are causing problems for many thousands of people, the onus should be on you to solve those problems, rather than all those people paying a price so that you can market your device."

Phonak's Engineering Manager, Graham Donald, says hearing aid projects funded by the three carriers at the National Acoustic Laboratories have so far resulted in two new developments. The first is a new housing incorporating very fine particles of stainless steel into the basic plastic form of the hearing aid cover. The second is to put a high frequency capacitor across the input stage of the hearing aid amplifier.

According to Bruce Macaulay, Senior Design Engineer at Cochlear Proprietary Ltd, which manufactures a world-leading cochlea ear implant, the company is conducting trials with Optus — and perhaps later with Telecom — to determine the effect of GSM emissions on its products.

The company will carry out the tests on around a dozen implantees over the next few months, and will wait until these are complete before deciding on any input to the RCC task force. But Macaulay says there have been no reports of GSM interference problems from its sales offices in Germany, Denmark and Portugal, where GSM has been operating for the last couple of years.

Automotive Problems

Australia's leading car manufacturers are clearly aware there may be problems, but are not overly anxious. Ford Australia, for example, is currently seeking advice from Telecom. "We're interested in seeing how the new EMC standards we are working to fit with the new GSM phones," said Ford's Managing Engineer, Sam Coulson, who also pointed out that his company's cars are put through stringent EMC tests in the US, along with vehicles from Europe, which need to be tested for GSM immunity. "Our experience is that bad installation and wiring of a mobile phone in a car is a greater cause of problems than any radio frequency emission," he said.

The Managing Director of Teleresources and publisher of the newsletter, *Mobiles*, Maurie Dobbin, says there is no serious threat to GSM and that "TDMA will always be with us." The chances of digital cellular mobile technology going back to the drawing board because of GSM's EMI problems are "zero" because around 100 countries are committed to the standard.

Dobbin says CDMA may emerge as an air interface standard with GSM as the intelligent network platform in markets where spectrum and congestion dictate this is needed, such as metropolitan areas with high density populations.

The Manufacturers' View

Nokia Telecommunications' Managing Director, Pertti Melamies, made it clear that GSM is standards-driven, not supplier-driven. "Nearly 40 countries are signed up to the MoU. The role of telecommunications suppliers like Nokia is to provide systems and services following the standard," he said.

On the hearing aid interference issue, the Nokia statement says: "There is now a new European Directive requiring products to withstand interference up to specified levels. GSM complies with this Directive. For instance, most hearing aids and many other products do not. Those using hearing aids have had to suffer for many years through inadequate design, resulting in interference from varied sources."

Ericsson Australia, which, like Alcatel, NorTel, Nokia and others, has spent hundreds of millions of dollars developing GSM products, says its parent group is conducting its own investigations into the interference issue. "While all electronic devices, particularly radio transmission equipment, can cause varying levels of interference, internationally the reported incidence of GSM interference has been minor," says a company statement. "In Germany, for instance, where there are more than 250,000 subscribers in the Ericsson-supplied Mannesman Mobilfunk GSM network, interference has not been a problem. GSM was adopted . . . as the standard for digital mobile telephony, and Ericsson has developed its products according to these accepted standards."

Technical Director of Alcatel Australia, Bruce Jones, says his company is already contributing to reducing the GSM EMI problems by installing dynamic automatic power controls in its handsets.

Motorola Cellular's National Marketing Manager, Rick Marmur, simply said that GSM was mandated as the Australian standard, and that his company builds to those specifications. He says there is a need for standards for such products as hearing aids and car computers that do not overlap with GSM standards. "It's no use the producers of those products saying: 'We were here first, so you should adapt to our standards'."

"The logical way to solve these problems is to ensure that each class of product defines the area in which it will operate, so that other products can stay clear of those areas. It's a changing environment that all these technologies have to work in."

AT&T's Regional Marketing Director of Worldwide Wireless Systems, Jo Roissier, says GSM's interference problems will see some service providers "pull their horns in" and delay introduction until the EMI/EMC issue is resolved.

Austel's Position

Austel, sensitive to claims that it approved GSM as the standard for second generation mobile cellular services in Australia when it already knew about the interference problems, says it did not become aware of them until March 1991 — months after its November 1990 recommendation to the then Communications Minister Kim Beazley.

Austel's Manager, Mobile Standards, Grant Symons, says "Even as late as March this year, at the GSM MoU Plenary and elsewhere, little information was available. The impression was gained that a great majority of the GSM MoU members considered there was either not a problem or only a slight problem that could be dealt with."

Further, Symons says a report prepared by the European Hearing Instrument Manufacturers Association on the GSM/hearing aid issue came to Austel's notice only in April this year. This was after Austel had received from Better Hearing Australia's Victorian branch the results of GSM/hearing aid tests carried out by Telecom Research Laboratories (TRL) and the National Acoustic Laboratories (NAL).

Austel confirms concern within the Cellular Dealers Association of Australia about the possibility of legal liability from selling GSM handsets and mobile units.

Asked whether third mobiles operator, Vodafone, was aware of the GSM interference problems when it was awarded its licence, Symons said: "Vodafone is one of the most experienced GSM operators in the world. It is in a good position to be well informed on the issues in question."

In fact, Vodafone's Engineering Manager, Neil Marley, has told recent forums that interference problems first came to the notice of GSM's designers and the UK Department of Trade and Industry in 1989.

In an interim report on the development of Wireless Personal Communication Services and Networks, Austel notes that 'the

Continued on page 29

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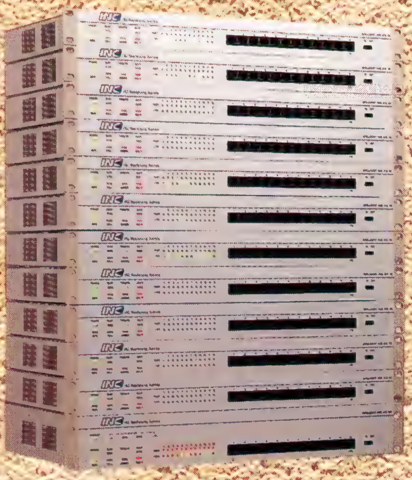

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United States

Cellular Theft — The New Growth Industry

The security problems of cellular telephones are well documented and the impression given is that our major worry is that someone may be listening in to our conversations. But that's not by any means the only potential security problem — or even the major problem worldwide. The real fear should be with the security of the billing system. Just as, a few years ago, automatic teller machine users found to their horror that thieves were stealing PIN codes through various devices and withdrawing money from private accounts, we now have a similar problem with cellular phones. Recently in Florida, seven people were arrested for stealing identification codes from AMPS handsets (the same type used in Australia).

They were counterfeiting handsets which were then used to milk the mobile networks to the tune of $US3.5 million. These handsets identified themselves to the network as current users, so all calls made were charged to the customer without his/her knowledge.

The $US3.5 million figure, you will note, is just the established sum which could be attached to this single arrest. The way the scam works is that pirates use special scanners to track and identify the cellular signals. They then unscramble the codes to reveal the essential identification and authentication information. These codes are burned into new chips, and the chips inserted into stolen (or Taiwan-assembled) handsets, which are then being sold cheap on the black-market. With one of these phones you can make phone calls on someone else's account for some considerable time as long as you don't get greedy and make so many calls that the owner notices them on his/her bill.

Cellular fraud relies on the use of a sophisticated ESN (the cellular handset codes) reader/scanner which can pick up the serial number of a cellular phone call being placed three or more kilometres away and descramble the codes. These specialised scanners cost about $US5,000, but they can pay for themselves in just days.

The US Government has recently moved to make possession of any scanner of this type illegal, but it is not expected that this legislation will be effective in stopping the scam. The stolen ESN (with its PIN), is programmed into an EPROM, which is then fitted to the new/stolen phone.

Another variation on this theme in the US is that the pirates flog international phone-call services on street corners in depressed migrant suburbs. Before the owner gets the bill and takes action to cut the connection, thousands of dollars worth of free international calls will have been made. This is mainly a problem in Florida, with Cuban refugees phoning home for a half-hour chat.

They Love LA Too

But although the recent arrests were made in Florida, the centre of this thriving industry seems to be Los Angeles, which apparently accounts for about 10% of America's estimated $US300 million in annual cellular phone losses. This 1993 figure is the estimate of the Cellular Telecommunications Industry Association (CTIA) itself, and it represents a three-fold increase over the $US100 million estimate issued last year.

According to the Guidry Group, a specialised company of fraud detectives employed by cellular carriers across the States, the pirating techniques seem to have evolved in Los Angeles before spreading across the country. In 1992 there were only twelve arrests for cellular fraud nationwide, but arrests in this year have increased to about four a month, with most in the Los Angeles area.

In 1992, a raid on a LA pirate cellular phone factory found that new phones were being assembled from imported parts, fitted with the EPROMs and sold on the streets as 'Ready-to-use cellular phones — no carrier turn-on required.' This means, of course, that the legitimate customer with the valid ESN will be billed a month or so later for all the calls. And if the pirate phone is taken interstate in the US, it will be two or three months before the owner sees the bill, since roaming bills take a couple of months to get to the home carrier.

Los Angeles Cellular and PacTel both refuse to put a figure on their losses, but a CTIA source told Telecom News that the two LA carriers had $US24 million of stolen-number calls this year, and the number was still rising. And these estimates can only be approximates derived from customer complaints and from an analysis of the chargeback fees exchanged by carriers when there are 'roamers' in the LA service area.

To add to the cellular operators' troubles, a decision by District Court Judge W. Tashima in November 1992 caused a complete halt to cellular phone fraud prosecutions by the Secret Service — the responsible Federal Government agency. Judge Tashima ruled that the Secret Service was not authorised to operate where cellular fraud involves the changing of ESNs.

It is a fine legal point, but according to the judge, ESNs are not the same as PINs or private access codes, which, through legislation, define the limit of Federal involvement in these State criminal matters. So currently, the Secret Service has dropped all cellular phone fraud investigations, and the US Attorney's office won't prosecute cellular phone fraud cases either. They are now trying to get the ruling overturned on appeal.

Stewart Fist

New Zealand

NZ Post Rejoins the Telecoms Business

New Zealand business now has a new service provider to choose from following the decision by New Zealand Post to re-enter the retail telecommunications market through its wholly-owned Synet Communications subsidiary. Among other services, Synet offers 0800, data communications and old-fashioned, hand-delivered telegrams. And although the company likes to say otherwise, this puts it in competition with Telecom Corporation of New Zealand (TCNZ) and Clear Communications.

The business focuses on three distinct product areas: data networks, messaging and voice services, although the main focus is on wide area networking, with an emphasis on supporting distributed computing and client-server networks. Synet's expertise in this area comes from operating NZ Post's Advanced Peer-to-Peer Network, said to be the largest IBM APPN operation in the world. Its voice products are mainly value-added services such as voice mail and 0800 toll-free calling.

The toll-bypass service is being marketed specifically to medium-sized businesses, and will largely be bundled with Synet's other products. Marketing Manager, Ms Colleen Poulter, says the service will be significantly cheaper than Clear or Telecom toll calls for customers ringing between the country's six main regional centres of Auckland, Wellington, Palmerston North, Hamilton, Christchurch and Dunedin.

The core business lies in data networks where the company supplies packet switched X.25 data services. Ms Poulter describes the X.25 service as Synet's 'bread and butter product.' Less frequently used, but growing in importance, is Synet's Express Frame Relay Service. Originally launched as Datanet Express back in September 1992, it was the first commercial frame relay service in Australasia.

Serving the X.25 and Express Frame Relay customers is a nationwide network linking the six main regional centres. Provincial centres are served off the main backbone network. Coverage is effectively nationwide because the network was originally developed to serve the nation's Postshops. Each of New Zealand's 200-plus Postshops has access to the Synet network and, not surprisingly, New Zealand Post is Synet's biggest customer.

Telegrams have been a Synet messaging service since 1986. The service now offers a 0800 toll-free number to allow people to send telegrams. Ms Poulter says the telegram service is very popular with credit controllers who find a physically delivered and

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signed-for document a useful way of reminding late payers of their responsibilities.

Synet issues 0800 toll free numbers in competition with TCNZ and Clear. It offers huge savings to customers directing the majority of their traffic to a single point from the six main locations. Ms Poulter claims customers can cut costs by up to 30%.

A Nimble Operator

Telegrams are not the only nostalgic feature of Synet's business. Its August 1 entry into the tolls business represents a return to a business it vacated when TCNZ was originally split from the New Zealand Post Office prior to corporatisation, then privatisation. And although the Synet name has been around for some time, Synet Communications Limited is actually a new business (it came into being on April 1, 1993.) The company was born from the merger of Synet 1990 Ltd, also a New Zealand Post subsidiary, and Datanet, formerly part of the Datacom group.

Its seeming reluctance to position as a direct competitor with Clear Communications and TCNZ is partly due to a fear of being squeezed out of the market by the established larger companies.

But it's also a strategic matter. Synet is intent on positioning itself to serve a clutch of medium to large sized customers with a wide variety of communications products. In a business dominated by huge corporations, Synet's staff of just 80 employees makes it a nimble operator, while its links with NZ Post give it big corporation clout where it is needed.

Bill Bennett

Industry Development

Telecom Perseveres With the PDF

Telecom has reaffirmed its commitment to its Product Development Fund (PDF), despite a continued inability to fully distribute its annual $5 million budget. In fact, since its inception in 1987 as a method of promoting innovative Australian telecommunications product development, those in charge of the PDF have never managed to allocate even half this annual amount. The funds allocated for the period July 1992 to June 1993 were around $1.8 million.

Robin Court, Manager of the Product Development Fund, insists this is not because of any unwieldy bureaucratic process or lack on enthusiasm on Telecom's part. He claims there are several reasons for the low acceptance rate of applications: "One problem is undoubtedly lack of industry education about the program. People sometimes simply don't realise that Telecom provides R&D funding under PDF, and so don't apply." To remedy this, Court regularly speaks at Telecom Business Development Unit seminars, which are held around the country to promote the carrier's business services and provide advice to small businesses as to how they can optimise performance and reduce operating expenses.

However, Court says the main reason for rejecting applications is related to Telecom's guidelines for project funding. Companies applying for funds under the PDF must be able to convince Telecom that the project is both technically outstanding and commercially viable. "A lot of the applications we receive are not really well thought-out in terms of costing or development time. Although there is no arbitrary timeframe in which a company must present a finished product, we do require that companies applying for funds under the scheme show us a realistic business plan, and convince us of their ability to implement it."

Additionally, the project must both fit with Telecom's own strategies, and offer the carrier a tangible benefit. Under the scheme, money allocated to companies for product development is eventually paid back (with interest) via royalties on product sales.

The PDF is especially targeted at small businesses that have good ideas but lack the capital to make them a reality. The largest grant awarded so far has been $700,000, but Court said the average grant to a company is around $200,000, with the amount of the grant determined by the projected costs of developing a particular product. Court said products approved for development under the PDF are generally awarded the amount of money they request.

Despite an initial flurry of interest in the second year of operation, applications for funding have remained fairly steady at around 70 per year, and Telecom has consistently approved only around 10% of those applications.

Ray Liggett, Telecom's Director of Research, said Telecom was particularly interested in developing new and innovative online services, especially those which exploited the potential of ISDN, although he stressed that any worthwhile project would be evaluated for funding.

He rejected that suggestion that companies were deterred from applying because the application and approval process was too lengthy and time consuming. "We approved one project after just two months of evaluation, and the average time for an approval to be granted is just a few months," he said.

Speaking in Melbourne in July at the annual presentation of the latest crop of PDF products, Doug Campbell, Telecom's Group Managing Director, Network and Technology Group, said a strength of the PDF was that even one-person operations could gain access to vital R&D funds that would otherwise be unavailable to them.

Export Success

This year's presentation involved nine companies who developed products ranging from an anti-static mouse mat made from recycled vehicle tyres to an on-line racing form guide, a vandal-proof manhole cover, line and battery testing devices and an interactive selling tool for real estate agents.

One of the companies exhibiting a new product developed with the assistance of the PDF at this year's presentation was Security Domain. A grant from the fund enabled the firm to develop its Secur*edi* family of products, which includes a smart card which stores a digital signature that can be incorporated into electronic documents, ensuring the security of sensitive data.

Since launching the product, the company has made sales to major corporations both locally and overseas, and has grown from a small start-up to an operation employing over 20 staff.

Helen Sample, a director of the company, said developing the product through the PDF had been a positive experience. "The application process was very straightforward, but quite rigorous in that Telecom required that we present a very clear business plan complete with cost and progress 'milestones.' They also performed some in-depth market research before deciding to go ahead, to ensure that there was a demand for our product."

Sample said once the application had been approved, the company was assigned a project officer from Telecom's Research Laboratories who provided direction and feedback on the project. "Our officer was an expert in the field we were working in, so his input was enormously helpful. He was very 'hands-on,' and really understood what we were trying to do."

Sample said another benefit was that they were included in many Telecom marketing and promotional exercises, giving them added exposure in the marketplace.

She added that product development concepts that Security Domain staff had learnt through the project, as well as the strategic relationships and contacts that had been formed, had led to a second development project in the area of GSM.

Another PDF-developed product, Teletech's Loop-a-Line telephone line testing device, went on to win Telecom Australia endorsement in 1990 under the Export Endorsement Scheme. Teletech has sold many thousands of Loop-a-Line units to Telecom Australia, and is now exporting to the UK, New Zealand, South Africa and the Asia Pacific region, with plans to start selling in Mexico and the US in the near future.

Sarah Parkes

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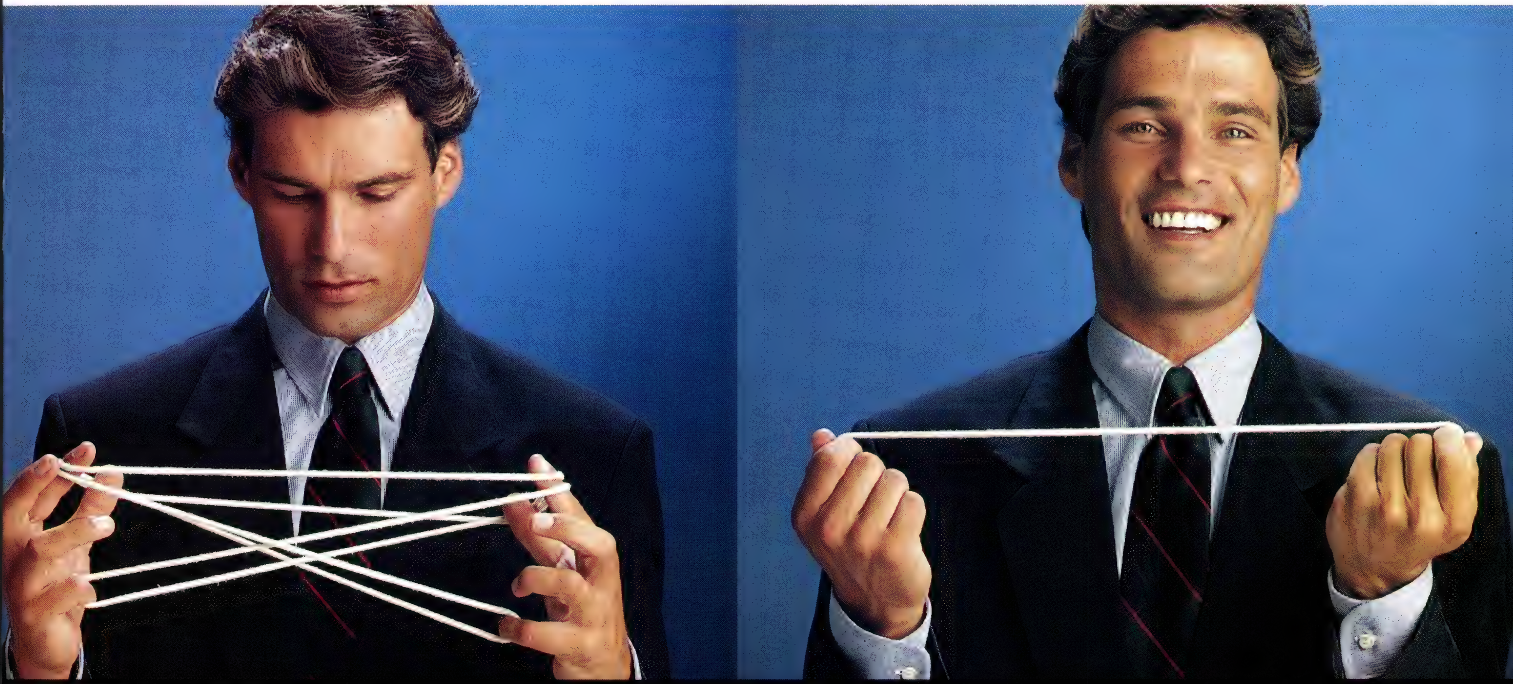

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GSM from page 22

majority of everyday electronic devices have been designed with only scant regard for electromagnetic immunity. Household appliances such as TVs, sound equipment, PCs and security systems are all candidates.'

The report also includes submissions on computer-controlled braking systems in motor vehicles and other safety critical systems under the control of wireless-linked multiple processors that might malfunction as a result of GSM interference.

On the question of the potential carcinogenic effects of mobile telephone emissions, Austel says no such linkage has been established, but that it will monitor a three-year survey of radiation risks by three universities and eight telecommunications companies in the UK.

Austel's views on the carcinogenic risks tend to be supported by Professor Stewart Bernard, Director of the University of NSW's Children's Leukemia and Cancer Centre, who advises the NSW Cancer Council on environmental causes of cancer. "I am aware that in the US, legal action was brought against a carrier in a case involving brain cancer. But I have seen no data that would support such a relationship, and I find the whole idea rather far-fetched," he says.

But in the ever-litigious US, headlines proclaim a cellular phone scare, while industry commentators speculate that a host of future products could be scaled back if the public is wary of their safety. Somewhat ironically, those fears tend to be confirmed by the fact that the US Cellular Telecommunications Industry Association has lifted its funding for new research into the possible link between cellular phone use and cancer from an original $US1 million to between $US3-5 million annually for the next 3-5 years.

Alternative Technologies

Other future technologies being examined by Austel include the Universal Mobile Telecommunication System (UMTS), Future Public Land Mobile Telecommunication System (FPLMTS) and Universal Personal Telecommunications (UPT).

CDMA is also under consideration, with Austel's interim PCS/PCN report stating: 'Austel notes that CDMA techniques suggested by Qualcomm for Wireless PCS are expected to require the use of lower transmitter output powers than most others.'

Hinting that he has more than a tidbit of scuttlebutt about CDMA, Grant Symons says: "We have looked very closely at this technology and it would be a very game man who says it has no EMI problems."

CDMA vs GSM

As the GSM interference issue continues to cause concern in Australia, CDMA's future looks brighter, with the US Telecommunications Industry Association (TIA) recently adopting Qualcomm's CDMA Digital Cellular Common Air Interface (CAI) specification as the North American CDMA digital cellular interim standard.

With the backing of a string of transnational carriers and equipment manufacturers such as AT&T, Nokia, NorTel, Motorola and others, Qualcomm clearly has global ambitions for CDMA, meaning it undoubtedly has plans to compete head-on with GSM around the world.

However, AT&T's Jo Rossier says "I don't think CDMA will be commercially or technically feasible in less than 18 months to two years, because of the complexity of the computer software and the infinite number of codes required. But it has a good possibility of eclipsing GSM at some point if GSM's problems peak," he said.

Alcatel's Bruce Jones added: "If Qualcomm had come along with CDMA five years earlier and low-orbit satellites had been around sooner, it might have changed the face of telecommunications."

Bernard Levy

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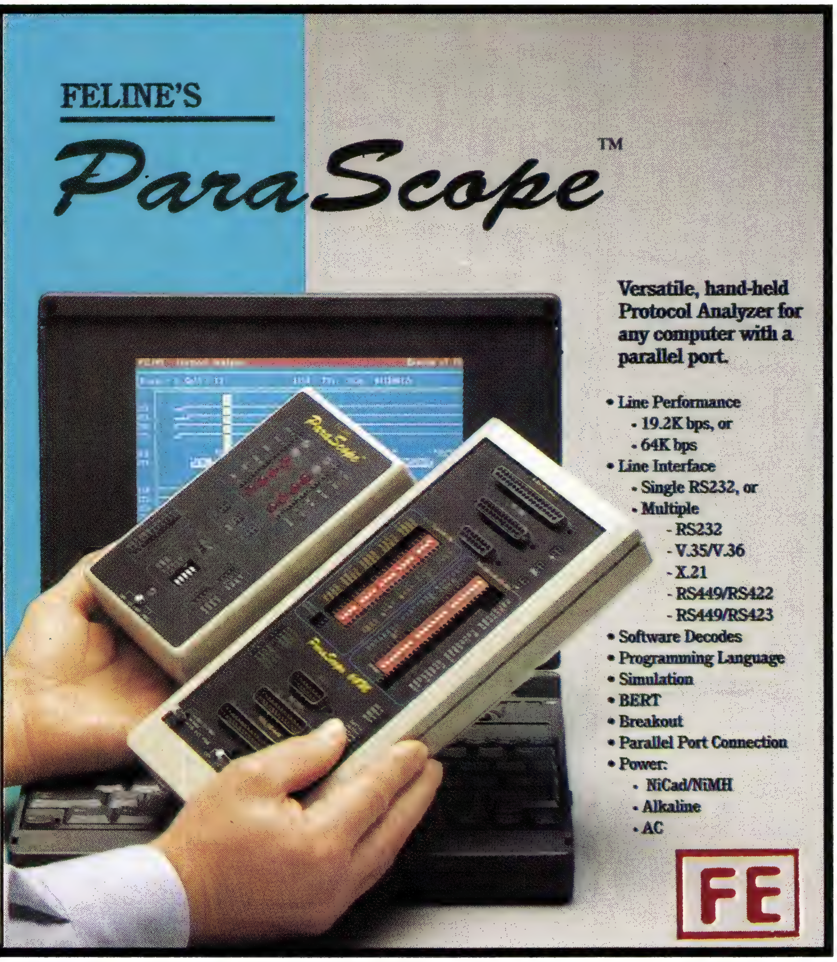

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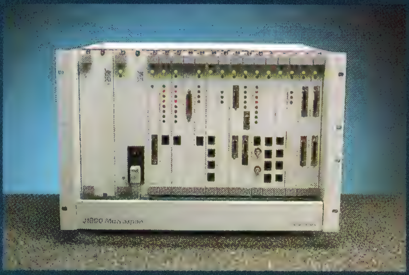

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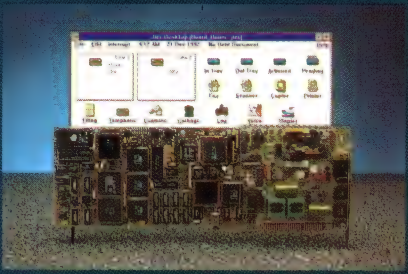

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Apple Unveils its PDA Vision

Is Apple's Newton MessagePad the harbinger of a new revolution in mobile communications?

Ever been to a revival meeting? Even if you are not a believer, you come away buoyed up by the spirit and enthusiasm of the event, and excited by a feeling that something important has happened. Apple is one of the few companies still able to generate this evangelical fervour. The event I'm writing about was a technical-press-only embargoed launch of the first Apple PDA ('Personal Digital Assistant,' or 'Newton MessagePad' if you want to be more specific). It's Apple's first release of a pen-based pocket communications terminal, which the company is keen to promote as being something quite different to a laptop or personal organiser, which Apple classes as 'computer devices.' The $1,500 MessagePad, Apple says, is a 'communications device.'

We old hardened technical journalists are not easily impressed, but I reluctantly admit that Apple has hooked me well. The Newton technology is just stunning; if it works half as well as it appeared in the demo, then Apple's onto a winner. And remember that this is the first-in-the-family in a range of new Newton devices which can only get better and extend out into wider fields.

I agree with Apple; the MessagePad is really a communications tool, not a computer. Let me take you through some of the factors here.

A Provisional PDA Glossary

PDA — Personal Digital Assistant. Apple and some others use this term to refer to handheld, pen-based computers with extensive agency functions.

PCCD — Portable Computing and Communications Device. This seems to cover everything from PDAs to laptop portables with a radio modem.

PIA — Personal Information Appliance. A term used to counter the 'Apple-isation' of the term PDA.

Newton — the name applied by Apple to the key operating system components. Newton will be licenced for use in fax machines, telephones, etc.

PCMCIA — Personal Computer Memory Card International Association. The organisation which sets the widely-used standards for small plug-in card systems. There are three 'types' and a number of different versions.

Electronic Ink — a standardised graphics file format which allows handwritten notes and drawings to be stored and transferred graphically, without interpretation into ASCII or symmetrical form.

First of all it is pocket-sized, the size of an airport spy novel, and about twice the weight. It will fit in your handbag, briefcase or suit side-pocket (but you won't carry it there for too long without distorting the cut of the cloth).

The main entry device is a plastic-tipped stylus, and you write on a pressure-sensitive LCD-based glass screen which covers most of one face. There's a new operating system driving the Acorn ARM 610 32-bit RISC chip, which converts your 'writing' into ASCII text, and allows you to control the thing though 'gestures' — tapping on the screen (simulates the clicking of a mouse) and dragging over words to highlight them (selection), or cross them out (delete) etc.

Now I know that pen-recognition devices have been a bit of a non-event in recent times (after every magazine and computer newspaper wrote them up as the wave of the future), but the early devices were really inferior laptops without keyboards. For hand-recognition to work as an input method, you need to be able to write reasonably naturally, and take notes at some speed.

I think Apple has now done this reasonably well, although until I've had one of the devices for a month or so, I won't be really sure. As with OCR (optical character recognition) and printed text, if the recognition-system is only 95% accurate it will become infuriating beyond belief. My experience has been that text recognition needs to have an accuracy of 98% or 99% to be useful. But, perhaps that's not really true for notes. After all, I can only read about 60% of the note-characters I write myself anyway — but I can usually work out what is meant from the context. Newton will probably be better than this, but it may require much more writing discipline.

Fortunately, there's a couple of very clever ways you train the Newton to read your idiosyncratic writing style, but don't expect it to understand those incoherent squiggles which trail off at the end of long words. The use of PDAs might eventually lead to better writing styles, which would be a good thing (especially for doctors).

An Agent of Change

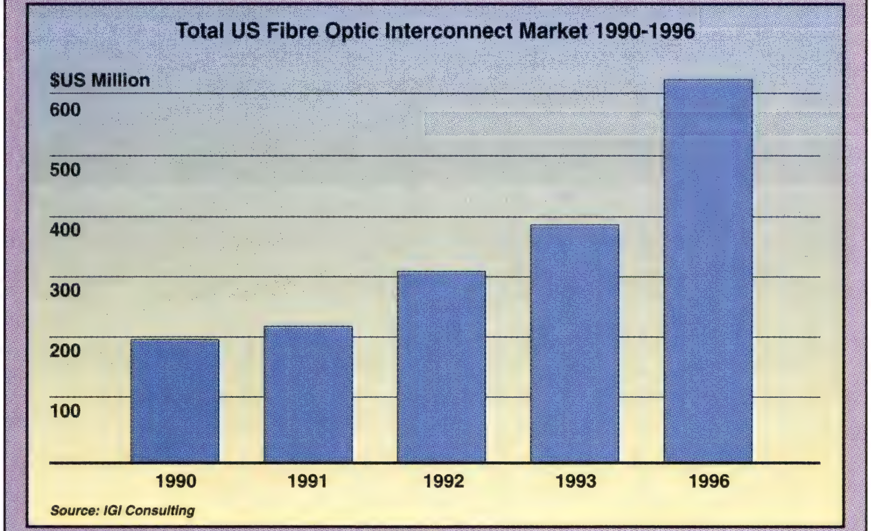
Also built-in to the operating system is the 'agent.' Apple has been talking about the importance of 'agents' for half a decade, and now they have arrived. In fact, I've got a very elementary one called 'Magnet' on my Macintosh now which automatically loads material I am working on, and reminds me of deadlines and appointments.

True agents are modules within the operating system (or utilities which hook into the OS) which watch the way you work, learn from your repetitive actions, and play a helpful role in assisting you. I guess they are part-expert system and part-personal database and part-customisable I/O.

If I write a short letter on the MessagePad, then scrawl at the top: 'Fax to Fred,' then highlight these and tap on the fax icon, the agent in the box will:

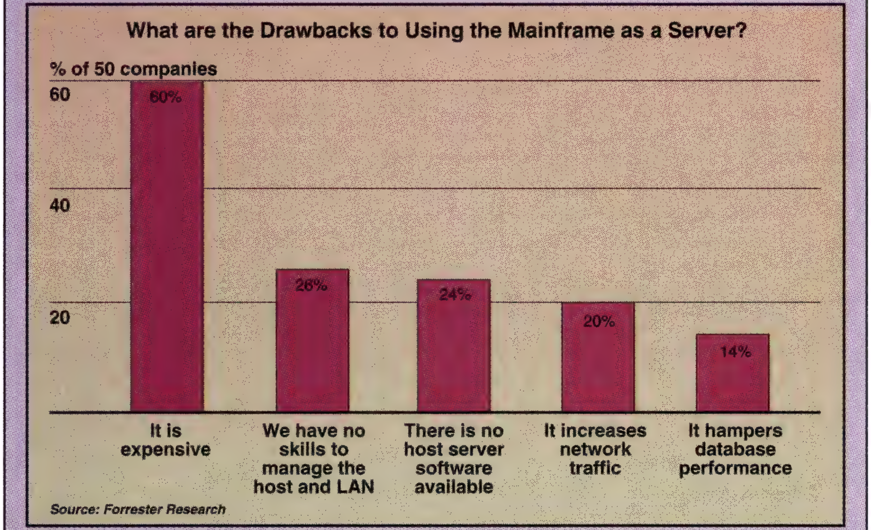
i) Look up my personal database of contacts and present all the Freds for my selection (I tap on the right one);
ii) It will bring Fred Bloggs' name and address into the document, and format it in the standard way — providing a preliminary page with my company logo, and a calculation of the number of follow-pages, etc.;
iii) It will also find and temporarily store the fax number along with the document, since I am not always in a location where I can fax the message straight away. If this is a local number and I am overseas, the agent will be smart enough to add the required international access codes. It knows it is overseas, because I changed the time, date and location information at the airport when I arrived;
iv) The next time I establish contact with a public-access telephone network (via radio, IR, direct modem, or using a Newton fax-type device) it will automatically send the message for me; and
v) It will confirm that the message was successfully sent, and maintain a copy for later filing.

Market Watch



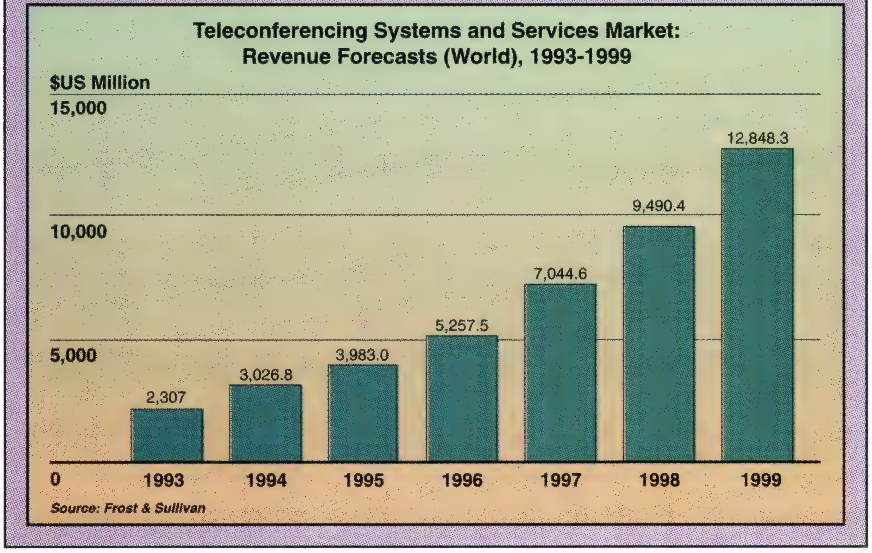
Total US Fibre Optic Interconnect Market 1990-1996

Source: IGI Consulting



What are the Drawbacks to Using the Mainframe as a Server?

Source: Forrester Research



Teleconferencing Systems and Services Market: Revenue Forecasts (World), 1993-1999

Source: Frost & Sullivan

This is what agents are all about — simplifying your life (if we are to believe the gurus) and taking care of the more mundane housekeeping and secretarial tasks in your computer/PDA. I'm not sure that Magnet is an agent in the real sense, because my understanding of the term requires an agent to be intelligent enough to learn from your actions, rather than needing to be taught. The MessagePad agent certainly does this.

The other agency example which is always trotted out at the early Newton press discussions is a scenario which goes like this: You write a note to yourself: 'Lunch with Brenda on Wed. at Bilsons.' The agent will understand enough to look-up Brenda in the contact list, recognise that 'Lunch' occurs around noon, and know that Wed. means 'next Wednesday.' It will therefore look up your electronic diary and add an entry at 12.00 noon on Wed. September 1 1993, with 'Lunch Brenda Bloggs at Bilsons' written in. It will ask you to confirm this, of course.

I'm still a bit cynical about how useful agents will be, I must admit, because there is often a downside to new technologies which are not always anticipated. I hope Apple has got good insurance for the day the CEO misses a critical business flight to Tokyo because his Newton MessagePad agent filed flight details under phone numbers and vice versa.

Communications Facilities

So far I've just talked about smart pocket-organiser stuff, with an extra few bells and whistles. But what makes MessagePad work as a productivity tool is really the communications facilities — both hardware and software.

First of all, you've got the normal RS-232/RS-422 connections for driving printers, modems and so-forth. But you've also got a PCMCIA 2.0 Type II slot, into which you can plug flash-cards (1 and 2 Mbytes at present) for either applications or memory extension; radio modems; and a paging device. Then, there's the infra-red link which can zap other Newton (or retrofitted) devices within a range of about 1 metre.

Let's start with the IR. It is a simple 'Beam' connection that you select from the menu in any of the functions/applications — communications is now a central part of the operating system, not an add-on utility.

Say you've just taken extensive notes of a meeting, and you want to give them to your secretary for inclusion in the next company newsletter; just point your Newton at hers, and they'll handshake and exchange the data at a rate of about 9.6Kbps.

Later, you'll be able to do the same to small IR detectors on desktop Mac and Windows machines (they will need some software of course). These exchanges can be password-protected to ensure that people walking past can't casually load or steal data.

Apple's Audio Vision

Apple last month released a new line of AV (Audio Visual) computers, which further direct attention to the convergence of computing and communications. The AV line consists of a range of colour monitors with built-in microphone and amplified loud-speakers, and two models of the Macintosh line which have been supplemented with video-circuits. This has all been placed under the control of AT&T's new high speed Digital Signal Processor (the DSP3210 at 55 or 66MHz).

There are three components to the AV technology:

- *Telecommunications* — The GeoPort telecommunications architecture is the key here. Apple says this 'is a plug-and-play access system for telecommunications that integrates data, fax and voice telephony. It is a software-based system which connects (through a PSTN- or ISDN-specific box) to the telephone system and supports phone calling and answering, and sends and receives both data and fax. The box is not a modem (that function is now built-in), but merely an adaptor and isolator for the specific type of telephone network.
- *Digital Video* — This now comes as part of the main system, rather than as an add-in card. All major standards are supported (PAL, NTSC and SECAM), and both composite and S-video (Y/C component) video ports are provided. You can now feed any of the common video sources (including a high-quality S-video camera) into the Macintosh and record it or process it. You can then replay it though the monitor screen, or alternatively output it (together with Macintosh-generated text or graphics) to a VHS or conventional large-screen television set. Frame-grabbing and video-sequence grabbing are also possible.
- *Speech* — The distinction is now being made between the digital speech capabilities used for telecommunications, and those used for computer control and to general local output. Apple has been working on the 'Casper' speech recognition technology for many years, and this has now become commercial.

Casper is a speaker-independent (non-trained) voice-recognition system which is currently used for commands only. It will recognise any set of terms used in the menus of a Mac application, and it handles long continuous speech particularly well. Phrases like 'Computer, select all' or 'Computer, set to 9 point' are interpreted quite well, it seems. There's a macro facility here also, to allow you to create verbalised short-cuts.

The second component is the PlainTalk text-to-speech voice-synthesis facility (both male and female voices) which is the best I've ever heard. Apart from the obvious advantages for the handicapped, I suspect that this will be a good way for many writers to perform a final check on their material, because it by-passes that awful 'word-blindness' that you develop when you've written and re-written material a dozen times. It's going to be a great way to avoid the obvious mistakes.

Stewart Fist

It is also possible that you'll use the IR to download other information — for instance, receive a new train timetable from a rotating IR cycle at the station, or find local tourist information from a tourist-information box on a street corner (in the language of your choice). Estate and travel agents might be able to use these PDAs as electronic brochures.

When you think about it, the range of potential applications for this IR 'Beam' link is extensive — provided it becomes a de facto standard. I can't wait to read about the first HSC school student accused of cheating by IR beam.

The second communications feature is the pager. This looks like a standard PCMCIA card with a half-matchbox-sized power unit stuck on the end. It has its own battery, memory and flashing LED, and it continues to receive alpha-numeric pages, even when it is separated from the MessagePad. When the LED is flashing, you will just plug in the module, and there all your messages are. Apple is negotiating with paging companies around the world, and they intend to hang these devices on the end of the international Applelink network.

The third feature is the radio modem which isn't yet available. This will provide two-way communications with the mobile data networks, and, judging by Apple's involvement with CDPD (Cellular Digital Packet Data), it won't be long before high-speed wireless data is as ubiquitous as cellular mobile phones (see 'Taking a New Look at Mobile Data' starting on page 85).

IBM is developing CDPD with a number of other companies, and those involved include some of the world's largest carriers. I suspect that CDPD is the essential technology element that will take PDAs out of the realm of super pocket-organisers, and into the mainstream of ubiquitous personal communicators. Since these links are two-way at 19.6Kbps, with the right plug-in module you'll also have direct wireless access to the company LAN. The Newton

Continued on page 40

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Cabling

Category 5 — What Are You?

'From time to time a new technology captures the industry's imagination and seemingly overnight becomes the focus of attention. Suddenly, telecommunications professionals have a new frame of reference that can be used to judge their past decisions regarding product and platform selection. A cabling system designer who three years ago recommended that 25-pair telephone cable be used for voice/data horizontal wiring has cause to be concerned if his client now wants to migrate from 4 to 16Mbps Token Ring. There is a feverish appetite to learn more about the data handling capability of embedded and planned infrastructure and how they measure up to this new performance benchmark we are hearing so much about: Category 5.'

The article in which I found this paragraph appeared in a magazine published by a US manufacturer of cabling products (*Wiring for the Future*, a Siemon Co. publication). The company was just about to launch a new connector block which complies with the Category 5 standard. Consequently, it was necessary to generate doubts in the minds of users and consultants about the suitability of existing cabling and to encourage them to upgrade existing infrastructure. The 'feverish appetite to learn' is generally generated by the manufacturers of the equipment telling us we have one. The article did, however, raise some interesting points which are worth closer examination.

Category 5 Explained

In 1984 the US telephone industry was deregulated and AT&T lost, amongst other things, its monopoly over the cabling of buildings. At about the same time computing was becoming more distributed and the requirement for building data communications cabling started to grow dramatically. Consequently, users were in a bind: they had to make a building cabling decision without any experience and without Ma Bell.

It appears that the first response in such a situation is for the user community to call for a standard to be issued. (I am convinced that people don't want choice. If you have to make a choice you may make a mistake. Life then becomes too hard. This leads me to propose O'Sullivan's Law: 'The response to deregulation is to demand immediate reregulation by standards.')

AT&T was only too pleased to assist, and led the drive for the US EIA/TIA (Electronic/Telecommunications Industry Association) to issue a standard, which closely followed its product line and cabling philosophy. In 1991 this standard was issued as EIA/TIA 568 — 'Commercial Building Telecommunications Wiring Standards.'

Figure 1: UTP Cable Categories

Category	Service	Maximum Data Rate
1	Analogue Voice	N/A
2	Analogue Voice and ISDN	N/A
3	Voice and Data	10Mbps
4	Voice and Data	16Mbps
5	Voice and Data	100Mbps

In 1989 in Australia, wiring of buildings for telephone systems was deregulated and, following O'Sullivan's Law, the industry demanded a new wiring standard. Austel took up the call but decided that it was outside its terms of reference so handed it over to Standards Australia. A committee was formed (IT17) and it promptly decided to adopt the US standard, rebadged it for Australia and issued it as AS 3080.

This standard has been the subject of a number of articles in this magazine (see for example, 'Taking a Second Look at the New Wiring Standard,' *Australian Communications* July 1991) and the central topic of numerous conferences, so I will not go into the details — or the shortcomings — again. However, it has been widely adopted.

Amongst other things, the standard defined the performance for unshielded twisted pair cable (UTP) which would make that medium suitable for 'data.' At that time, everyone thought that UTP was at its limit at about 10Mbps and this limit was incorporated in the standard. UTP could then be used for carrying both Ethernet and IBM Token Ring LAN services. Higher speed data would be carried over optical fibre, the universal panacea. Remember also that, at that time, IBM was saying that you had to use its (expensive) shielded twisted pair (STP) cable for its Token Ring. Many people believed that and installed IBM cables.

The assumption about the speed limit on UTP was wrong. Carefully designed twisted pair cables can carry high speed data for the distances used in typical office environments at acceptable error rates. Consequently, the EIA/TIA issued two Technical Systems Bulletins (TSB) to supplement its 568 standard — TSB36 and TSB40. TSB36 deals with cable whilst TSB40 deals with connector hardware.

The TSBs talk about 5 categories of cable systems, but categories 1 and 2 are undefined. The uses for which the cables are intended are given in Table 1.

In determining the data carrying performance of a cabling system, a number of key parameters need to be specified. These are:

Figure 2: UTP Cable Characteristics

	Maximum Attenuation dB per 305 metres			NEXT Loss Worst Pair dB per 305 metres		
Frequency (MHz)	**Category 3**	**Category 4**	**Category 5**	**Category 3**	**Category 4**	**Category 5**
0.064	2.8	2.3	2.2	-	-	-
0.150	-	-	-	54	68	74
0.256	4.0	3.4	3.2	-	-	-
0.512	5.6	4.6	4.5	-	-	-
0.772	6.8	5.7	5.5	43	58	64
1.0	7.8	6.5	6.3	41	56	62
4.0	17	13	13	32	47	53
8.0	26	19	18	28	42	48
16.0	30	22	20	26	41	47
20.0	40	27	25	23	38	44
25.0	-	31	28	-	36	42
31.25	-	-	32	-	-	41
62.5	-	-	36	-	-	40
100	-	-	52	-	-	35

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- *Attenuation* — the reduction in signal level, attenuation is generally measured in decibels (dB). It is also measured in terms of the voltage change.
- *Near End Crosstalk (NEXT)* — measures the amount of coupling between different pairs in the one cable. The signal from one cable (the disturber) appears as a foreign signal at the other (disturbed) cable. For multi-pair cables, the worst case NEXT occurs when all pairs disturb a single pair.
- *Characteristic Impedance.*
- *Structural Return Loss* — the amount of signal which is reflected back into the device due to poor matching of the device to its cable/connector.

The TSB36 specifies minimum values for these parameters for cables. These characteristics are defined so that the cables will transmit data at the specified rates over 100 metres of cable (see Table 2). In all cases, the characteristic impedance is 100 Ohms.

One of the most important factors effecting the performance of cable at high speed is crosstalk. Oftel, the British equivalent to Austel, has issued a Wiring Code which sets out the requirements for voice and data cabling which connects to the PSTN (O'Sullivan's law is universal). It defines five categories of cable, based on their crosstalk characteristics (called XT1 through to XT5). These categories line up very closely with TSB36 definitions.

Category 5 cabling, however, should be considered as more than just cable which complies with the Category 5 specification. To ensure that end-to-end performance is satisfactory, the whole installation needs to meet the standards.

This means cables (horizontal and backbone), terminal blocks, modular connectors and patch leads all must comply with the appropriate standards. An important and often overlooked issue is the termination of cables on blocks and connectors. Tests have shown that severe crosstalk can be introduced into circuits if the twist in cables is undone too far. Hence, the standard specifies the maximum distance that the cable can be 'untwisted' at each termination. For Category 5, this distance is 13mm! If you are planning on a Category 5 installation, watch your installers very carefully.

Both these standards are meant to supplement EIA/TIA 568. Consequently, the overall installation can only be considered to comply with Category 5 standard if it is installed in accordance with the main standard.

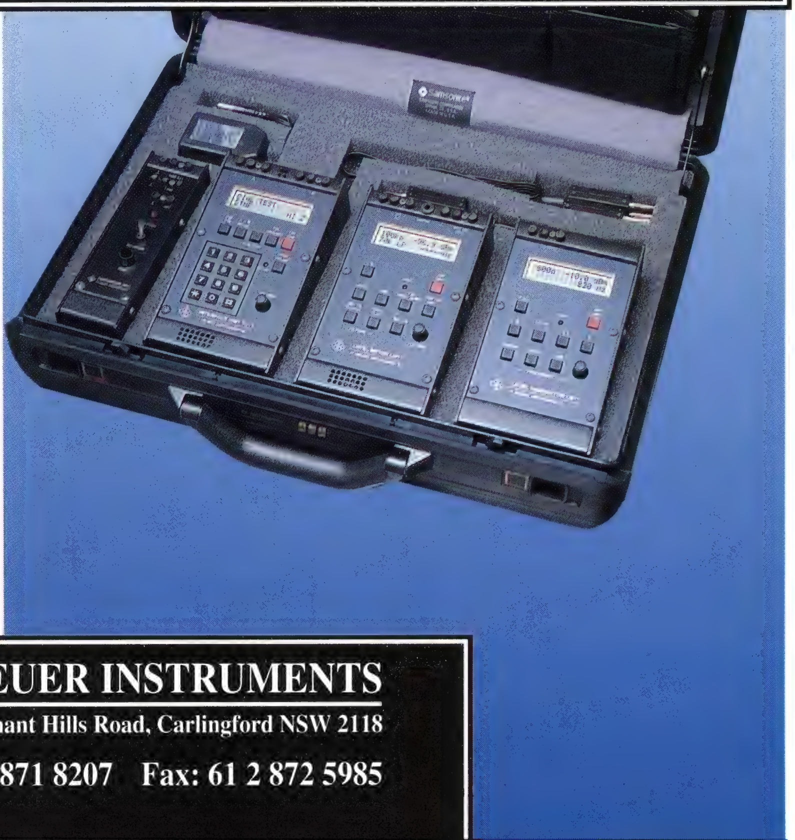
Who Needs it?

Category 5 cable is required to enable 'copper FDDI' (CDDI) to be provided to each workstation. Stop to think about what this represents. CDDI operates at 100Mbps. This is the same information contained in about 40 500-page novels; or the entire Encyclopaedia Britannica; or 100 CAD drawings; or 10 X-ray images — delivered every second! The human brain is a marvellous thing but I can't see it processing information at this rate. The future video phone will probably operate at less than 2Mbps — 384Kbps looks good — so even this is no justification. However, if you want to put High Definition Television to each workstation, 100Mbps may be appropriate.

It is true that some applications will benefit by these high speed data rates; achieving these rates on LAN backbone will also be required. I believe, however, that most workstations will not benefit. (I know that the proponents of multimedia will argue that these rates are necessary. With current in-ground cable plant, the carriers are able to provide high quality TV to the home at 2Mbps. Even with Category 3 cable, this leaves 8Mbps for other services!

The GOSIP standard for cabling calls up Category 5 cable (but not, it appears, Category 5 connecting hardware). The argument used to justify it is that the high data

Continued on page 41



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Electronic Mail

Directories Looking Up

The realisation of ubiquitous e-mail directories is still a long way away. But a number of organisations are working towards the goal. Recently, the Asynchronous Protocol Specification (APS) Alliance released what may be the new international standard for dial-up messaging and directory services.

The new specification is designed for asynchronous OSI communication over dial-up access networks with a particular focus on X.400/X.500. The specification also covers both client-server and server-server communications.

Not only is the alliance working on the APS for X.400 e-mail, now that the dial-up spec has been finished the alliance is moving portions of the specification into the wireless arena. The potential of wireless is the reason that many of the vendors are involved with the current specification.

"The technology is nothing new but it fills in gaps that are found in the 1988 X.400 spec," said David Winter, a group manager at BT. Formed in October 1992, the Alliance now sports more than 30 members including Apple, Intel, AT&T and BT.

To achieve this goal, the alliance has decided to take a top-down approach by looking at OSI standards for dialling X.25 as well as Internet protocols for point-to-point and PAD networks.

The APS provides a lower layer protocol based on some existing standards and implementations such as PPP, Z-Modem, or HDLC start/stop. The new specification also provides a bit-transparent transfer service, supports the use of flow control, and makes point-to-point solutions symmetric. There are also no restrictions on the use of particular transport services, however, it does provide a X.213 interface and runs higher layer protocols transparently.

Synchronisation

Elsewhere several other user groups are also devoting considerable time to solving the problems with e-mail directories and X.500. At a recent US EMA (Electronic Mail Association) meeting, several user groups presented home grown solutions to synchronising e-mail directories. Many of these in-house solutions are now being considered by the X.400 Application Programming Interface Alliance (XAPIA), which is currently looking into developing a common synchronisation specification.

According to Ed Owen, Chairman of the XAPIA, the alliance is examining whether directory synchronisation is something that can be designed as an API or if it will have to be a new protocol. "A lot of users have home-grown ideas that synchronise directories for their mainframe e-mail system and LAN-based system but there is no system out there that is a standardised. We are in the begging stages of deciding what we should do and how to do it."

Soft-Switch's President Mike Zisman, said that the XAPIA should take a look at all the possible technologies that were present at the meeting and develop a common specification. He added that it will be important that the development of the new synchronisation standard not turn into the recent VIM/MAPI controversy, which emerged in the electronic mail-enabled application API arena between Lotus Development and Microsoft.

Mike Moeller

Wireless Communications

FCC Sanctions US Wireless Network

The US Federal Communications Commission (FCC) has taken the first two steps in creating a nationwide network for wireless data communications by freeing up radio spectrum space and granting a 'pioneer's preference' to a company to begin constructing the 3,000 transmitters needed for the network.

The FCC plan calls for the awarding 11 US nationwide licences, 13 licences within each of 49 regions, and 10 local licences, including eight that would be used by existing paging companies.

Mobile Telecommunications Technologies (Mtel), the company that developed the technology to transmit data rapidly over a narrow channel has been granted the pioneer's preference, which means it has been assigned the first nationwide licence. Its system is expected to be in operation in the top 300 US markets by 1995. The wireless network is comprised of nearly 3,000 base stations and satellite links. The network will also be connected to the public telephone network.

Mtel's Nationwide Wireless Network finds its subscribers automatically in order to supply them with messages. This takes the responsibility off the customer of having to inform the network of their exact whereabouts.

The FCC has designated three bands of the radio spectrum for wireless data communications — 901-902, 930-931, and 940-941 MHz. Another band will be reserved for future channels. Under the new rules, 10-

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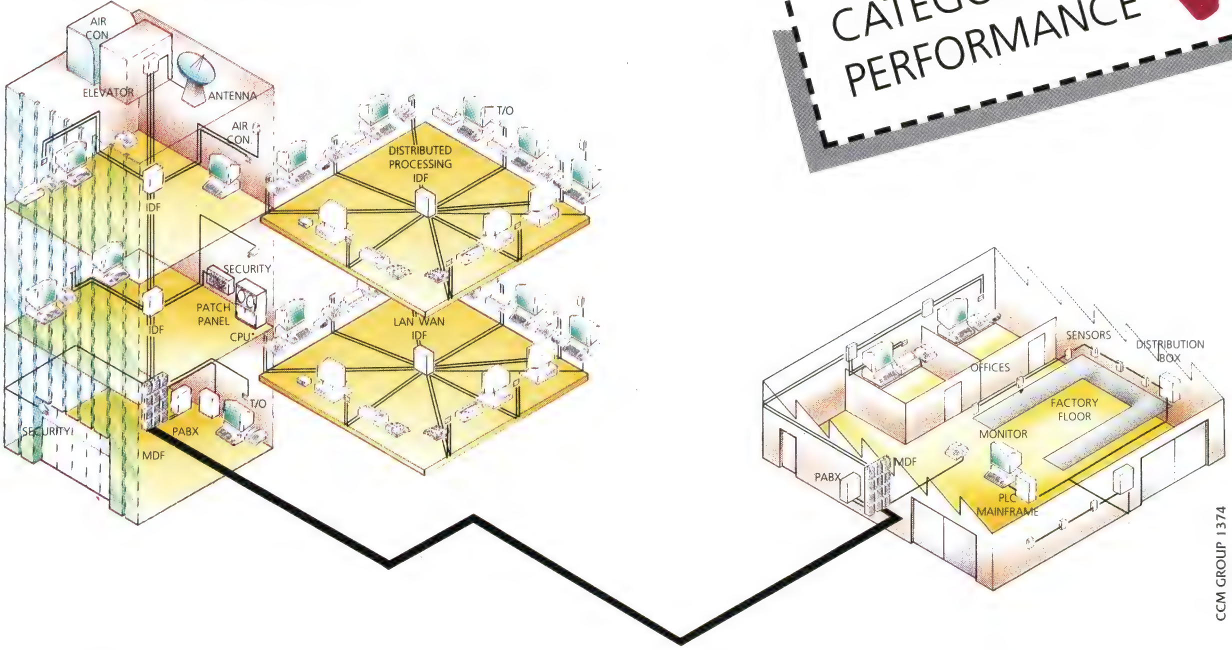

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year licences will be awarded. Licensees are allowed to combine up to three channels.

Before licences can be awarded, the US Congress is requiring the FCC to establish auction rules before they are sold.

Currently, Mtel has three types of hardware products on the drawing board. A standalone unit will acknowledge messages and have the ability to transmit brief messages; a PCMCIA type II unit that will allow users to have more sophisticated fax and modem capabilities; and a chipset for PDAs will give third-party developers the opportunity to build their own hardware.

The inclusion of PCMCIA technology is important because the ability for PCMCIA cards to handle fax and modem transmissions will make portable computers lighter and faster and will eliminate the need for internal fax modem boards or pocket modems, analysts say. Mtel believes the Nationwide Wireless Network will be an important part of the future 'virtual office.'

The demand for wireless communications, specifically wireless data transmission, is skyrocketing as laptop and palmtop computer sales similarly soar. And industry analysts estimate that by the end of the decade, 13 million people will be using wireless data services.

Ann Steffora

PDAs from page 33

supports AppleTalk protocols and these are ideal for wireless connections (either wireless LAN or wireless WAN). They avoid the complexity of needing a new connection to register and to be granted access to the network: AppleTalk simplifies the whole network management problem, which is one reason why IBM was so interested in doing a deal with Apple.

Although I've talked about Apple products exclusively here, don't forget that the MessagePad is built for them by Sharp, and Sharp are releasing their own version at the same time. Apple has licenced the Newton technology to a wide range of companies, and it seems that each intends to specialise in a different area of the market. We should soon see A4-sized devices used mainly for form-filling in warehouses and we'll certainly see Newton panels attached to telephones, PCs, fax-machines, and eventually photocopiers.

Why many feel this is so important is because there is a feeling that the PDA will usher in a new era of short messaging, and it's time that we addressed the issues that raises. Back in mid-July a substantial one-day seminar was held at the Marriott Hotel in Santa Clara (California). It was billed as the 'Mobile Information Networks Seminar,' and was interesting for the ideas that were being tackled and particularly for the width of vision about the future of PDAs.

High on the list of questions discussed was that the real value of Personal Information Appliances (PIAs) may be their ability to tap real-time information. But how will on-line information services serve mobile users? Are banks, restaurants, barber-shops, retail stores, transportation systems about to go on-line and wireless? Everyone is talking about location-independent computing — but they are on the wrong track. The real value of mobile computing will be the ability to access information specific to the mobile user's location. How will navigation systems, electronic maps, and mobile data networks empower handheld users?

All around the world the carriers have been doing their best to nobble electronic mail and message handling systems (except for their own value-added versions) for most of this decade. But now with the radio links, I suspect that messaging has finally escaped their grasp. I'd be willing to bet that by the end of the decade we send as many short messages as we now make phone calls, and that there'll be more PDAs in use than cellular telephones.

Stewart Fist

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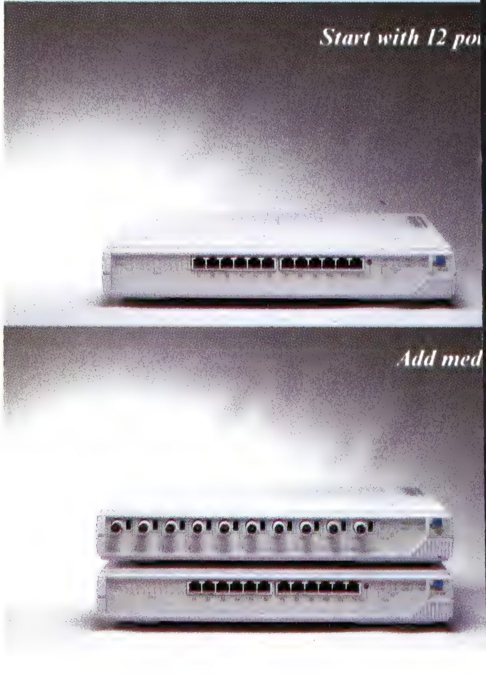


Category 5 Cabling from page 36

rate capacity *may* be needed in the future and the incremental cost is insignificant compared to total cabling installation costs. In fact, Category 5 cable is about $1 per metre more than Category 3 cable. Combine this with higher priced components and extra installation time and a Category 5 installation may cost up to 30% more.

The other point to note is that most organisations re-organise their offices every 5-6 years. (Well, they did before the current recession). These re-organisations are not just rearranging people into existing locations. They are either moves to new accommodation or complete refurbishment of the current office. In either case, the existing cabling is generally useless. The workstation furniture is all changed (and, of course, the cables run *in* the furniture so they have to be pulled out) and the builders, in their usual subtle manner, cut the cable to get them out of the way. So if you install a Category 5 system, you are paying 30% extra for a system which isn't needed now and will probably be pulled out in 5 years.

Jim O'Sullivan is the Principal Consultant with O'Sullivan & Co, Consulting Communications Engineers based in Ourimbah (NSW).

Wireless LANs

Hiperlan on Track

ETSI (European Technical Standards Institute) and the ERC (European Radio Commission) are now working together to define a new standard for a family of high speed radio LAN devices, called Hiperlan, due mid-1994. The two are also collaborating in efforts to convince the 32 signatory countries to the ERC to make a common band of spectrum available across Europe.

The collaboration is the result of a joint desire to beat the Americans to the market. The US IEEE is defining 802.11 for 'cordless LANs' as part of its Project 802 group. Hiperlan and P802.11 are expected to fight it out for market share from late 1994.

Since 1991, the ERC has been promoting its recommendation T/R 10-01 in Europe for a spread-spectrum technology in the 2.4GHz band, while ETSI has been working for a couple of years on a Wideband Data Systems standard. The recent collaboration has resulted in an early definition of the Hiperlan proposal which requires 150MHz of spectrum to be set aside for common use in the 5.4GHz region. Spread-spectrum is the favoured technology at the present time.

Data-rates are expected to be at least 10Mbps and the technology will be suitable for vehicles within a factory complex at speeds up to 36kph. This limitation creates the distinction between wireless LAN and data PCS developments.

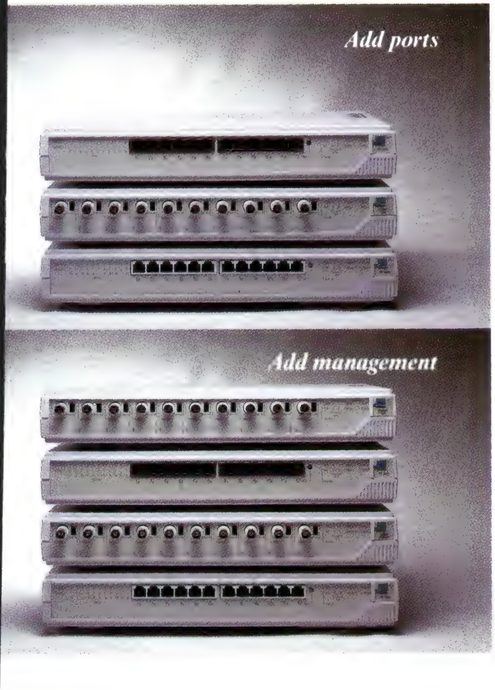
But Hiperlan will be more than just the definition of an air-interface for in-company use — it also includes a 'services and facilities' document which covers access to e-mail and general messaging services on public-access networks, and it will have a full set of management features. It will be useable on-site and off-site.

The current service outline assumes that many LAN systems may need to co-exist and that they should be able to be installed without needing specific frequency allocation or site licensing. The philosophy is that cordless LAN systems should be robust and intelligent enough to be able to share the same frequency band without causing interference to each other.

CT-2/CAI and DECT (Digital European Cordless Telephony) will also come on-line in 1994 and have data capability back to a company PABX and in the street through Telepoint services. But the data-rate of CT-2 and DECT may be too low for widespread use except for short-messaging.

Stewart Fist

hub, a *hub*, and a **hub.**



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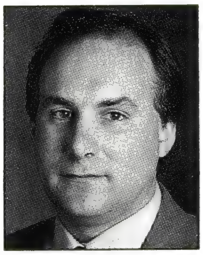
LAN VIEWS

Non-Routable Protocols in Distributed Environments



Graeme Le Roux

As companies plan the deployment of distributed systems which rely upon messaging systems rather than basic protocols for the provision of transport mechanisms, one of the issues for network designers is whether or not to deploy routable or non-routable protocols in their network systems.

Non-routable protocols, that is those protocols which have no ISO Network layer, are quite common. LAT and NetBEUI are examples of such protocols. These protocols have a number of advantages over their routable counterparts such as DECNet and TCP/IP. They are small, quite efficient in a strictly local area network and, most important from a user's point of view, fast. One of the reasons that users perceive them as fast is that by not having a network layer address, and by relying heavily on broadcasts for address resolution, they avoid all the housekeeping which must be done in the background by a routable protocol such as TCP/IP. Even if your network has only 80386 and 80486 workstations and servers running Windows, the sort of processes which have to be built into a routable protocol to handle fragmentation and packets arriving out of order, ARP requests, subnet masking, and so on, will have an impact on a user's workstation.

In a message-based system, a user's workstation is already lumbered with a number of compute-intensive tasks. Just try cranking up several Windows applications and then add a scheduling application and e-mail in the background: you will always be able to tell when your PC checks the mail server. Using a routable protocol simply complicates matters. Nor is this situation likely to change for the better. If you have been following Alan Lloyd's *OSI Tutorial*, you will probably be considering buying shares in a company which manufactures memory.

OSI's designers are paying a great deal of attention to efficiency, but there's still no such thing as a free lunch. If you want the features and functions OSI provides, you have to pay for them. You are going to have to supply memory and CPU bandwidth. Nor will your users be overly impressed if you simply rely on virtual memory — that is, local hard disks. Even the fastest hard disk, attached to the fastest controller you can find is at best an order of magnitude slower than an average memory chip. The old adage that nothing improves the performance of virtual memory like real memory is still very true.

> *"By building a network in which workstations use a non-routable protocol to communicate with a local server, which in turn uses OSI to communicate with global network resources, an extremely reliable, efficient and secure network is possible."*

Fortunately, messaging systems are typically defined to be quite independent of their transport mechanism. As a result, they can be deployed over non-routable protocols just as easily as routable ones. From an administrator's point of view this allows all the problems associated with protocol processing overhead to be side stepped. It also avoids most, if not all, the complicated, protocol-specific configuration required on workstations — that means no more figuring out dozens of different sub-nets, default gateways etc. for all of several hundred workstations.

Of course this does not mean that you will be able to build a network without using routable protocols. While it may be technically possible, it is expensive, particularly over wide area links, and many of the management features and functions which are found in routable protocol suites are unavailable when a non-routable protocol is employed. In a message-based system your workstations will pass messages to message transfer agents (MTAs) which will reside on your network servers. Servers which may or may not be PCs. Workstations will not have to run terminal sessions to hosts or make direct use of other non-local resources. In most cases, these MTAs will have to use routable protocols between each other, that is, across a campus or WAN backbone. The reason for this is that the flexibility of routers in areas such as load balancing, routing policy and automatic employment of multiple carrier technologies such as ATM, ISDN, etc. on demand to manage traffic cannot be matched by bridges.

There are a number of advantages to this model, aside from simplicity of workstation configuration. For example, if you build a backbone which carries routable protocols only, and which is accessible only via routers, then workstations which have only non-routable protocols installed are not physically capable of accessing remote (i.e. outside their immediate workgroup) resources without a protocol translation performed via an MTA running on a physically secure, carefully managed and fully audited server. Even if a user somehow managed to connect their workstation directly to the network backbone, they would find that they could not even log on to their local server for lack of the correct protocol. It would also be a simple matter to set management software to detect the presence of an unauthorised protocol on the backbone. An administrator could then, using the workstation's MAC layer address, trace the source of the transmission and shut down the hub port from which the transmission originated. This does not mean that users could not access remote resources — say another user's local files. Such access would be possible, but only via two MTAs.

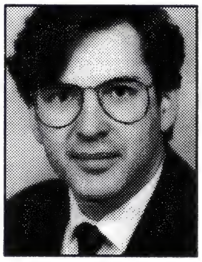
This model fits nicely into the emerging OSI protocol model. By building a network in which workstations use a non-routable protocol to communicate with a local server, which in turn uses a full OSI implementation to communicate with global network resources, an extremely reliable, efficient and secure network is possible without complex workstation configurations. This sort of model does place a higher processing load on servers. Even if your network depends on purpose-built routers rather than server-based software, you still have to deploy sufficient server CPU bandwidth at each workgroup to handle protocol translation, message storage, message transfer and so on. In addition, it is likely that a distributed environment will rely on workgroup servers to do a significant amount of 'front-end' style processing.

Perhaps the single most compelling reason for a network administrator to deploy non-routable protocols is that by doing so, user workstations become one less consideration when you must implement new backbone protocols — like OSI — and messaging platforms which will support 'rightsized' EDP systems running on an enterprise network system, as well as new network intensive applications such as multimedia.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

INTERNETWORKING

A Word to ATM Detractors: Baloney!



Nick Lippis

The asynchronous transfer mode (ATM) bandwagon is travelling a bumpy road these days. Analysts and vendors who once sang ATM's praises are now scaling back predictions for its success. In the eyes of many experts, ATM has been transformed from a linchpin networking technology to just one of several possible solutions for corporate networks that, in their current form, aren't particularly scalable, manageable, or high performance. Some have even called ATM the ISDN of the 1990s.

I have one word for ATM's detractors: Baloney! I'm not backing off from my original prediction that the ATM market will be huge — its value will grow into the multibillion-dollar range within three to five years. While network architectures based on other technologies, such as switched Ethernet, FDDI, and, to a lesser degree, Token Ring, may provide some short-term network relief, they simply don't and won't scale to handle larger numbers of users and high-bandwidth applications.

More than 150 vendors, including makers of network adaptors, hubs, and WAN switches, have announced ATM plans and strategies. Their products aren't just vapour, as some ATM sceptics would have you believe. In fact, three vendors — Fore Systems, SynOptics Communications, and Network Equipment Technologies (NET) — have real products that are mature enough to give network managers the chance to evaluate their capabilities and applicability to corporate networks.

Of the three current ATM leaders, Fore Systems has the largest installed base of ATM products. The startup, founded by researchers at Carnegie-Mellon University, has more than 80 ATM customers, 20 of which are in Europe. Fore's most prominent ATM offerings are switches intended for use in building campus networks, but it also offers the industry's most extensive line of ATM network adaptors. Fore sells ATM adaptors for many high powered workstation lines, including machines from DEC, Hewlett-Packard, Silicon Graphics, and Sun.

> *"More than 150 vendors, including makers of network adaptors, hubs, and WAN switches, have announced ATM plans and strategies."*

Fore's first major offering is an ATM switch called the ASX-100. The 1.2Gbps switch offers up to 64 ports, which can be a combination of ATM, Ethernet, or FDDI connections. Recently, Fore boosted its performance ante with the Switchcluster, a 10Gbps switch that accommodates 32, 48, or 64 ATM ports. ASX-100 circuit boards can be installed and used in a Switchcluster chassis, providing an upgrade path for early users. Both switches have a parallel bus architecture that offers a data rate faster than the sum of the input ports. This means that direct connections can be set up between any two ports in a non-blocking fashion. In conventional hubs ports are connected over a shared bus. Because the Fore switches are non-blocking, traffic is never prevented from reaching a destination due to congestion.

Fore's ASX-100 switch is unique in that it offers interfaces to both ATM and conventional LANs, allowing networks to be built that support new ATM connections and existing shared LANs. Fore's switches also have built-in IP routing to handle conventional LAN traffic. At this point, Fore's biggest challenge is developing its marketing, support, and network management muscle. It also needs to address its failure to develop a significant number of management applications to date.

Depending on which market researcher you ask, SynOptics is either the number one or number two seller of network hubs. Its initial goal in the ATM market is to provide products to build ATM-based LANs and campus networks. In the future, it expects to offer ATM WAN interfaces, as well as connections to Ethernet and Token Rings LANs. In March, SynOptics took the wraps off two ATM hubs, the Models 10102 and 10104. Both are 5Gbps products, upgradable to 20Gbps, and both offer up to 16 ATM interfaces. SynOptics is pitching the Model 10102 as a high-end workgroup hub, while the Model 10104, which has more fibre ports, is intended for campus-wide networks.

Unlike Fore's products, the SynOptics ATM switches have a matrix architecture. The SynOptics design is not totally non-blocking, so congestion in the switch could prevent traffic from gaining a path to its requested destination. SynOptics has implemented a distributed buffer, a cell randomiser, and higher internal switch data rates to minimise the potential for blocking.

The biggest advantage that SynOptics may have is price. The price/performance ratio of SynOptics' switches seems to be about six times greater than the Fore or NET ratios. SynOptics attributes its lower price to its switch architecture, as well as low R&D and manufacturing costs. SynOptics purchases its core ATM technology from Washington University in St Louis. SynOptics sells its hubs through distributors, but it is creating a direct sales force for its ATM products. It also intends to sell ATM products through its distributors after the technology becomes better known. SynOptics still has to add non-ATM interfaces, such as Ethernet and FDDI, to its switches. The vendor also must develop a distributed version of its connection management software.

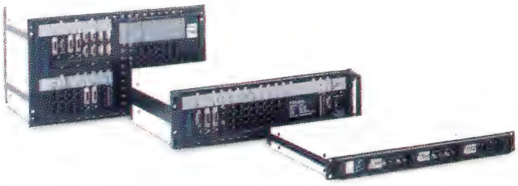
NET's Adaptive Corporation subsidiary was one of the first vendors to announce and deliver an ATM hub and interfaces. Adaptive, now a division within NET, announced its products in July 1992. NET's ATM strategy includes selling ATM hubs for high-end workgroups and campus networks, integrating ATM switching into its IDNX multiplexers, and licencing ATM chip technology to chip vendors.

NET's ATM switch, the ATMX, is a 1.2Gbps switch that holds up to 16 add-in cards, providing up to 90 ATM ports. The switch is based on a bus architecture. NET's challenge will be distribution. NET intends to sell the ATMX, a LAN and campus-wide product, through its direct sales force, which basically has strong WAN experience. It remains to be seen if the sales team can adapt.

In all cases, Fore, SynOptics, and NET offer price/performance ratios nearly 100 times better than vendors of conventional routers. How successful anyone ATM vendor is will depend largely on software, which provides the means to set up and manage connections, control and monitor networks, keep congestion from impeding network traffic, give conventional router-based networks access to local ATM networks, perform change management, and more.

The bottom line, however, is clear: for networks with stuffed-up nodes, ATM switches are the answer.

Nick Lippis is President of Strategic Networks Consulting. He is based in Rockland, Massachusetts.



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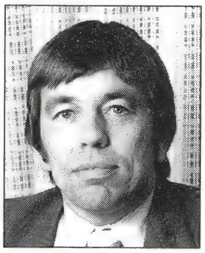


Systems Management and B-ISDN

Alan Lloyd

This is one of a series of open systems tutorials by Alan Lloyd, Strategic Developments Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

There seems to be a lack of traffic engineering in network design today. Normally a 'protocol list, box technology' approach is used and the addressing, management and the cost of operational issues ignored. This approach can generate IT problems on a scale that is equal to the trading position of the business. IT systems, particularly distributed systems, require management. This management must be designed into the system (not just tacked on) and must serve the business. Therefore models are required to design systems on that basis and standards for the management models and protocols should be used where appropriate in this process.

The standardisation of information technology is being progressed worldwide by the activities of the CCITT and ISO. A key part of this activity is the development of standards which provide a consistent approach to systems management and the management of telecommunications networks.

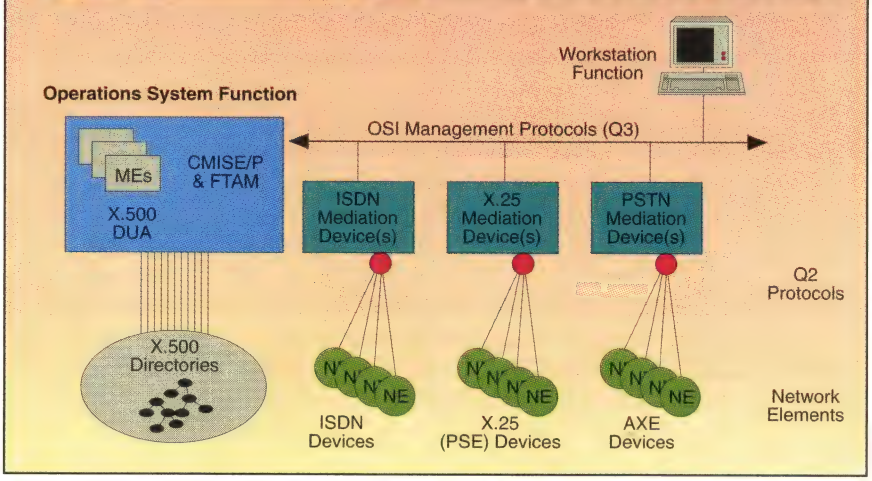
The primary standards being produced for management are the CCITT I series for B-ISDN, ISDN and Intelligent Networks (IN), the CCITT X.700 series for the OSI Systems Management (CMIP, etc.) and the CCITT M series for the Telecommunications Management Network (TMN). More recently, because of emphasis on service-based networks, standards for Operations Support Systems are being developed.

In addition to the management standards relating to specific communications technologies (such as X.25 and ISDN), there are four main areas of management standards:

- *Telecommunications Management Network* standards — TMN is the model for defining the logical network components and functions which are used for the management of network technology that provides carrier services.
- *Intelligent Networks* standards — IN is the model for defining network services and functions in a logical way that decouples them from the underlying network technology that supports those functions.
- *Customer Network Management* (CNM) standards — CNM is the model for defining how the carrier-provided network components and functions being used by a customer can be managed by that customer.
- *OSI Systems Management* (or CCITT X.700) — OSI is the model and definitions for the system architecture, protocols, functions and managed objects within a distributed management system.

These standards deal with core technology definitions and are telecommunications service independent. TMN provides the overall management functions of the total network and its services to the carrier/administration. The IN and CNM components are subordinated to TMN in that they provide the management of services provided by the carrier to the network user. The OSI systems management standards are used to 'construct' the components of the higher level functions. They provide the engineering tools for TMN, IN and CNM systems.

Figure 1: TMN and OSI Standards



TMN Standards and Functions

TMN standards, although still maturing, provide a framework for networks that provide management services to other networks. These standards provide an operational architecture, a management network architecture and the management functions needed to manage large scale or telecommunications networks.

From an organisational perspective, the TMN standards define a network architecture in which the management traffic between the network devices (Network Elements) and the network control centre (Operations System Function) is carried over the Data Communications Network (DCN). This information is controlled by network operators using the Workstation Function (WSF). In order to concentrate management information (alarms, etc.) and possibly perform protocol conversion of management information for the Network Elements, Mediation Devices (MDs) are used between the NEs and the DCN. (See Figure 1.)

The management functions defined for TMN in CCITT M.3010 1988 version cover performance management, fault management (alarm surveillance, testing, etc.), configuration management (provisioning, etc.), accounting (billing) management, and security management. These functions are service level management functions which are supported by the lower level management functions as defined by OSI management standards like alarm reporting (CCITT X.7xx) and the respective communications level management standards.

TMN's high level functions support the transmission, traffic and signalling management functions as required by a carrier for the lower level network management entities and equipment. Figure 1 on page 46 shows the architecture of the TMN management system and identifies the OSI protocols and functions that can be used within the TMN e.g. the use of File Transfer, Access and Management (FTAM) for software distribution. In addition, the OSI X.500 directory can be used as a knowledge base to hold network information for the overall management system.

Because carriers are attempting to reduce their cost of operation, the integration of their management systems is vital. They are using the TMN activity to consolidate their overall management operations, provide a consistent framework on which to develop and procure equipment and to provide consistent service level facilities to the carrier's customers (e.g. billing and service provisioning). As TMN models the administrative and operational management of the network technologies and services it must also interface with the service level management functions as provided by the Intelligent Network functions and any of the value added services (e.g. X.400 Messaging, EDI) provided by the carriers.

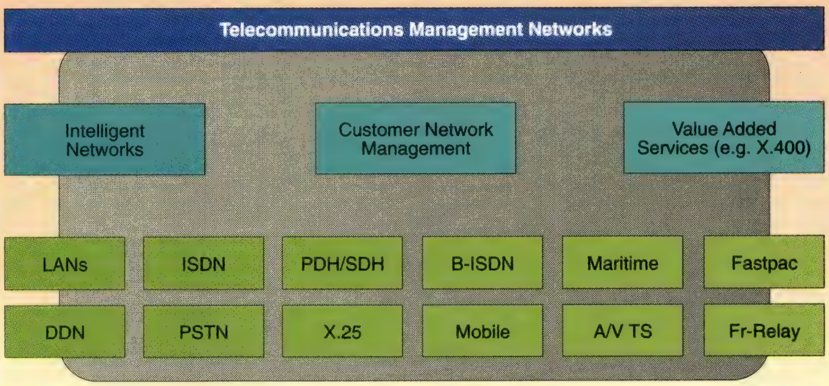
Figure 2 identifies the full scope of TMN and its coverage of the service and communications aspects of carrier technologies. While this level of coverage is still some years away, the direction is set. With respect to B-ISDN, work is already in progress to develop an integrated approach to IN and TMN systems. Draft standards that define a management model and architecture for X.400 messaging are being circulated for comment. These draft X.400 standards incorporate those models as defined by TMN and OSI management standards.

B-ISDN Node Management

Taking Broadband-ISDN (B-ISDN) as an example of a specific communications technology and expanding its management architecture and networking requirements, the management interfaces to IN and TMN can be identified. The B-ISDN Node has been architected with a set of communications functions to deal with the protocol levels required for B-ISDN services. The architecture also defines a set of abstract planes which delineate the user switching requirements of the node from its control and management requirements. Figure 3 identifies these characteristics.

The Transmission and Interfaces function provides ATM cell framing, multiplexing, physical medium, bit timing, regeneration, physical level operations-administration-maintenance (PLOAM), rate decoupling, cell delineation, cell header check and cell payload scrambling.

Figure 2: The Scope of TMN


Telecommunications Management Networks
Intelligent Networks
Customer Network Management
Value Added Services (e.g. X.400)
LANs
ISDN
PDH/SDH
B-ISDN
Maritime
Fastpac
DDN
PSTN
X.25
Mobile
A/V TS
Fr-Relay

The Switching function provides physical cell switching, logical cell switching (VPI/VCI), multipoint and multicast, flow control, SVC and PVC control. The Traffic Control function provides congestion notification, PDU discarding (cell loss processing), priority control, buffer management, traffic shaping and policing and call blocking (CAC).

The Network Adaption function provides the adaption services between ATM and other communications technologies (e.g. Frx, 802.6). such as routing information, flow control, end-to-end OAM, end-to-end user control information, error detection and correction. The Network Services function can provide the higher level ATM network user services such as network interworking (gateways) and connectionless servers.

Associated with these protocol and switching functions are the node's management system. This is viewed from the control plane and the management plane. The control plane relates to the establishment of calls and connections and the resources needed in the node to handle these. It deals with the network signalling system(s) used (e.g. CCITT CCS#7) and interfaces to the higher level IN services. In alignment with the IN architecture, some of these functions could be part of the IN Distributed Service Logic.

The management plane handles the operational and administrative management side of the node. Primarily, it deals with statistics, status, configuration and fault reporting (alarms). The management plane logically interfaces as a Network Element to the higher order TMN management functions and the network services functions.

The control and management planes of a B-ISDN node will contain signalling and management capabilities which relate to the node itself, to the higher network management system and the network as a whole.

Management information and control is interfaced to the B-ISDN node. From the

Figure 3: B-ISDN Node Management

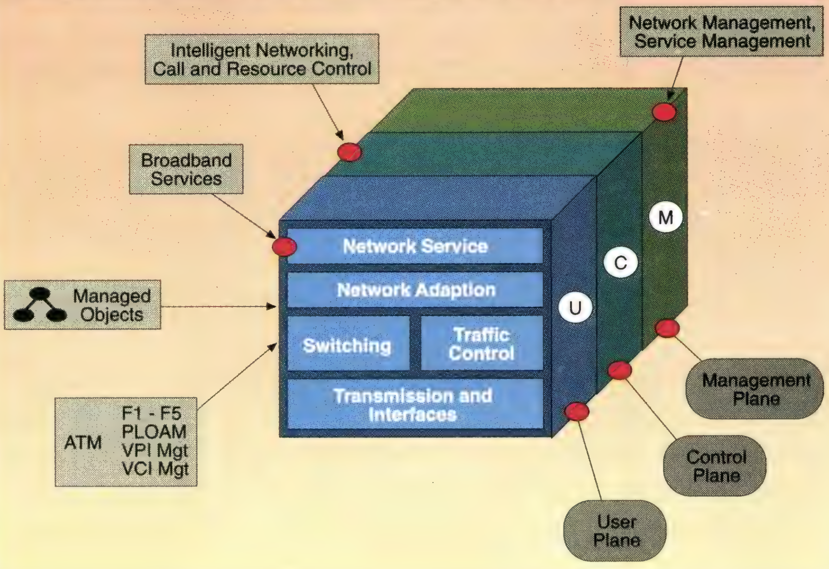
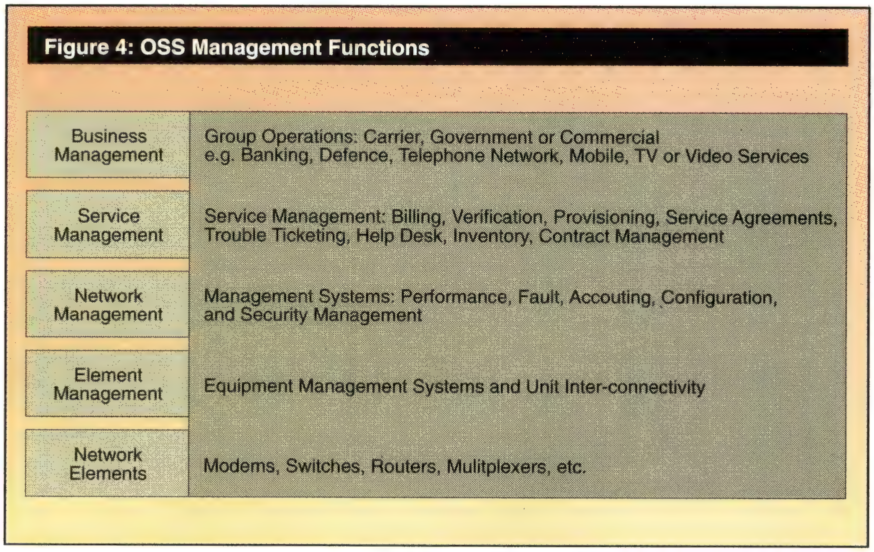


Figure 4: OSS Management Functions



Business Management	Group Operations: Carrier, Government or Commercial e.g. Banking, Defence, Telephone Network, Mobile, TV or Video Services
Service Management	Service Management: Billing, Verification, Provisioning, Service Agreements, Trouble Ticketing, Help Desk, Inventory, Contract Management
Network Management	Management Systems: Performance, Fault, Accouting, Configuration, and Security Management
Element Management	Equipment Management Systems and Unit Inter-connectivity
Network Elements	Modems, Switches, Routers, Mulitplexers, etc.

ATM perspective, CCITT I.361 assigns five logical reference points (F1 to F5) for ATM switching: F1 specifies the transmission regeneration level of the network; F2 specifies the digital section level of the network; F3 specifies the transmission path level of the network; F4 specifies the Virtual Path (Virtual Path Identifier, VPI) level; and F5 specifies the Virtual Circuit (Virtual Circuit Identifier, VCI) level.

Above the ATM circuit level, management information and control occurs using higher level signalling or management protocols which are transferred management assigned B-ISDN-ATM connections.

CCITT I.361 deals with F1-F3 as Physical Level OAM (PLOAM) and allocates VPI = 0 and explicit VCIs for PLOAM. Idle cells are also allocated a VPI = 0, VCI = 1.

The requirements for meta signalling (call channel), general broadcasting and point-to-point signalling are at the F4 Virtual Path level and assigned specific VCIs within each VPI i.e. VPI = xxx, VCI = 1, 2 or 5.

To deal with VP management of the F4 level for flow control of the segment or the end-to-end flow control requirements, VCIs of 3 and 4 are used.

In the case of in-band management of a specific VC (the F5 level), the Payload Type (PT) bits of the cell are used to indicate management control protocol is present. Where PT = binary 100 or 101 the cell is used for segment and end-to-end flow control respectively. Where the PT bits = binary 110 the cell is used for resource management (e.g. of the AAL/F5 level).

Other PT bits are used at the F4 and PLOAM levels to indicate that a switch has detected congestion.

The management information for each node function (e.g. traffic control) and each protocol entity and circuit should be defined as OSI managed objects. Draft standards are now becoming available for the managed objects in Narrowband ISDN, X.25, CLNP and Transport entities.

AAL Management

At the higher layers of ATM are the ATM adaption layer (AAL) functions. The AAL functions are divided into three sub-layers.

The top Service Specific Convergence Sub-layer (SSCS) interfaces to the network user (Network Adaption), the Common Part Convergence Sub-layer (CPCS) and the Segmentation and Reassembly Sub-layer (SARS). These sub-layers have some protocol defined such as segmentation and reassembly, sequence numbering, multiplexing, buffer management, data alignment and tagging. These protocol mechanisms are used to accommodate the AAL user's data transfer.

The AAL functions and their protocol mechanisms will require management such as initialisation, configuration and the ability to deliver alarms. The way in which the errors detected in the ATM layer (e.g. traffic flow and quality of service) are signalled to the management in the AAL and its user also requires further study.

Further work is needed to define how the AAL protocols will be used for inter node management between the AAL entities in a network. Management communication can take the form of explicit protocol identification. e.g. by using the CPI field in the Convergence layer protocol or by assignment of an explicit multiplexing ID for the SARS management signalling. Alternatively management control and information can be achieved by the internal processing of the node which interfaces to some higher order management function. In this case, management control operates over a preassigned management circuit.

Operations Support Systems

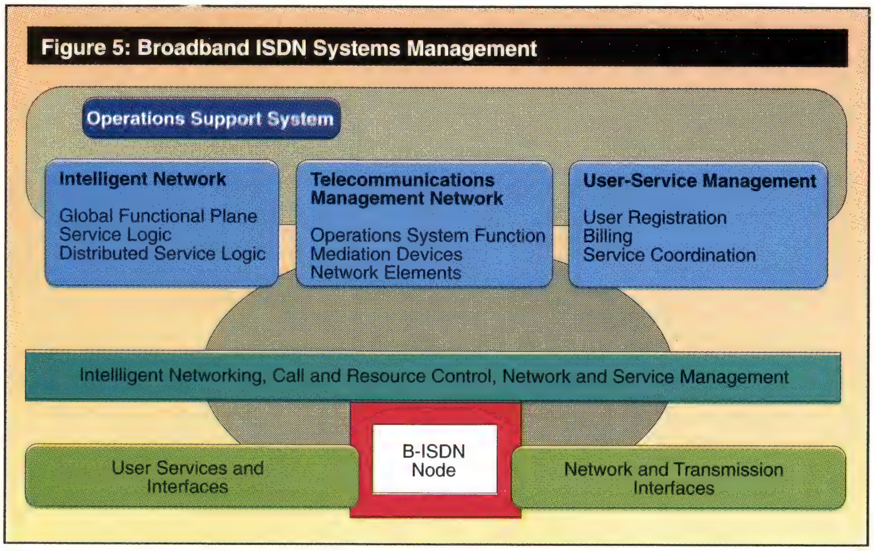
Services provided by communications networks, including that of B-ISDN technologies, will require management at the operational level. A way in which high level management systems can be developed is through the concept of Operations Support Systems. Being a high level requirement, a top down approach is needed.

If one is providing services to customers as a business, the management system must be business oriented and manage the network elements as components of a service. With B-ISDN as the converging technology for voice, data and image services, Operations Support Systems (OSS) have to be in place. This framework can also be used as a cost model for the various levels of management. For example, Network Elements embrace the costs of equipment development, purchase and installation. The Network Management level includes the cost of the network operations centre and operational training, etc. (See Figure 3 in July's *OSI Tutorial*.)

Figure 4 shows some of the management aspects of each level. Note that it is only a framework and the details are not exhaustive.

Service level management embraces the elements of the network. Network services users are provided with management fac-

Figure 5: Broadband ISDN Systems Management


Operations Support System
Intelligent Network
Global Functional Plane
Service Logic
Distributed Service Logic
Telecommunications Management Network
Operations System Function
Mediation Devices
Network Elements
User-Service Management
User Registration
Billing
Service Coordination
Intelligent Networking, Call and Resource Control, Network and Service Management
User Services and Interfaces
B-ISDN Node
Network and Transmission Interfaces

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ilities that relate to the use of the services provided, not just as uses of communications protocol interfaces. Service and network management levels, for example, embrace the higher level TMN and IN management requirements.

In the future, if carriers decide to offer their services in a dynamic manner and with attractive cost options, the support for such a business must rely on a dynamic and fully integrated service oriented management system. In fact, service management is essential to meet user expectations of B-ISDN for service on demand for multimedia and image distribution.

From a service level perspective, the functions required of the OSS include service and contract agreements, billing, help desk/trouble ticketing, traffic management (redundancy, bandwidth on user demand, etc.) and Virtual Private Networking. These requirements will be reflected on the Network Management Centre functions and the actual networking equipment itself.

All these aspects of network management systems exist, but they have grown in a tactical way. The advantage of using standards and working with recognised models is that from the business level, management systems can be developed in a consistent and coherent way.

Figure 5 on page 48 brings all of the aspects of B-ISDN management together and provides an overall consolidated view of the B-ISDN management system through to the high business level functions of Operations Support Systems.

Conclusion

Although an integrated system comprising service level management across high performance networks is still some years away, the carriers are attempting to achieve this goal. From a B-ISDN perspective, a consistent approach to management which enables the management of the technology, the network user interfaces, the service aspects of the network, the carrier management requirements and the carrier's customer will enable B-ISDN to be rapidly adopted in a cost effective way. By using the same approach to management of X.400 messaging systems and large scale corporate networks, the costs and risks of running a network can be minimised.

Please note that this feature provides an overview of the direction of communications technologies and the evolution of management systems. It is based on the standards and strategic work being performed in this area. Where explicit information is required, the author, the standards or the working parties involved with such standards should be consulted. Next month's feature will take a look at directory systems from a business and operational perspective.

Alan Lloyd

Technology Update

■ Two Standards For 100Mbps Ethernet

After more than eight months of bickering and disagreement over the merits of two 100Mbps Ethernet proposals, the IEEE has given up trying to hammer out one standard and has decided to standardise both proposals. The two sides — one including Grand Junction, Intel, Cabletron, Chipcom, Sun Microsystems, National Semiconductor, 3Com and SynOptics; and the other led by AT&T and Hewlett-Packard — failed to come to an agreement over how to change the Media Access Control (MAC) Layer of the original 802.3 10Mbps Ethernet standard to fit the emerging technology. "Both sides felt that it was critical that products come out right away, so we decided that it would be best to just come up with two standards and let the market decide which suits their needs," said Patricia Thaler, chairperson of the IEEE 802.3 committee. The standard developed by Grand Junction, 3Com and others called Carrier Sense Multiple Access with Collision Detection (CSMA/CD) retains the 802.3 Ethernet's data access method and only calls for changes to the MAC's physical layer. It will run on Category 3 or two-pair UTP wiring. However, HP and AT&T's proposal — called 100Base-VG — changes the CSMA/CD MAC Layer and uses a 'demand priority' protocol to allow Ethernet to handle more complex applications. It is a better solution for the future, according to AT&T and HP, as Ethernet LANs begin to handle multimedia applications. 100Base-VG has received the support of Cisco, Banyan, Microsoft, and Novell. It will run on four pairs of voice grade unshielded twisted pair wire known as Category 5 wiring. While both sides will offer different products, both use the same packet format currently in 10Mbps Ethernet — thus enabling 100Mbps Ethernet to co-exist and interoperate with 10Mbps LANs. The 100Base-VG technology is made possible because it uses all four pairs of wires in 10Base-T twisted pair wiring to transmit and receive, rather than just one pair to transmit and one pair to receive, as in current 10Mbps Ethernet. In March, HP decided to forge ahead with the development of 100Base-VG adaptors and hubs, which are set to be available by year's end. On July 19, Grand Junction announced a pact with several vendors, including Intel, to develop CSMA/CD adaptors. The HP and AT&T standard will fall under the wing of a new IEEE 802.12 committee, while CSMA/CD will be placed under the IEEE 802.14 committee.

■ Single Standard For Customer Switching

Austel has resolved the issue of conflicting customer switching standards, after a lengthy debate between competing proposals by Optus and Telecom. It has selected Telecom's proposed standard, which is an augmented version of the CCITT digital version of system R2 line signalling, commonly called R2D. Austel arrived at the decision after extensive discussions and consultation within the Standards Advisory Committee and its Working Group 3/1.

■ Cisco Dumps APPI Technology

Cisco has announced it has signed an OEM agreement with IBM under which it will license IBM's Advanced Peer-to-Peer Networking technology for use in its family of internetworking routers. In a decision which marks a significant turnaround, Cisco says it will propose to the multivendor APPI Forum that a decision be made to halt the development of APPI and further pursue the opening of APPN. Under the agreement with IBM, Cisco will license the source code and intellectual property rights necessary to implement APPN Network Node routing. Cisco Australian Country Manager, Richard Fremantle, said that although Cisco and other vendors had realised significant gains for the industry through its work on APPI, it had become apparent that it would not be possible to bring a viable APPI product to market because of the patent restrictions on APPN. IBM has published the APPN specifications, licensed the related patents and set up the APPN Implementors' Workshop (AIW) as a means for sharing APPN developments with other vendors and users. The patents restrict the evolution of the specifications and keep the APPN architecture proprietary, requiring that all enhancements be approved by IBM through the AIW. Cisco said it will actively participate in AIW activities and encourage the evolution of the group into a true multivendor decision-making body.

■ US TIA Adopts CDMA Interim Standard

The US Telecommunications Industry Association has adopted a cellular interim standard based on Qualcomm's Code Division Multiple Access (CDMA) technology. The new standard will be called IS-95, and was developed by the TIA's TR45.5 engineering subcommittee based on a specification submitted by Qualcomm. As a result, the US now has two competing digital cellular standards — IS-54, which is based on TDMA, and the new IS-95.

■ Philips Claims Transmission Record

Philips Kommunications Industrie in Germany says it has broken a distance record after adding a new laser component to its synchronous digital hierarchy (SDH) 2.5Gbps telecommunication system. The system now spans more than 360 kilometres at 1550nm under normal operating conditions, using a standard single-mode optical fibre and three optical amplifiers. Philips said its tests also proved that the system is not yet dispersion limited.

Micom's Dynamic Network Server

With its ability to dynamically allocate bandwidth, the Marathon 10K is ideally suited to organisations with a number of branch offices.

One of the peculiar things about the IT industry in general, and the network hardware industry in particular, is that products are often marketed on the basis of features that most buyers are unlikely to use before they replace the product in question. One common example is wide area backbone products capable of driving multi-megabit point-to-point WAN links. The reality in Australia, and most of the rest of the world for that matter, is that the bulk of wide area point-to-point links operate at bandwidths of 64Kbps or less.

In fact network managers often have trouble justifying the cost of a 64Kbps link between offices in capital cities, let alone to small remote sites. If a company's business involves regional offices and smaller local branches, and requires voice and facsimile services between those offices in addition to data services, then telecommunications charges can often make small branches unprofitable. This results in small branches being closed in favour of regional offices, and the loss of the sort of local customer services which can often be a company's sole market edge.

This is not a new problem. It is the problem which the founders of US-based Micom Communications Corporation saw as a market opportunity in the early 1970s. Datacraft Australia's founders also saw the potential for a range of products which could address this market. In 1974, Datacraft signed its first distribution agreement with the then embryonic Micom, and in June the companies celebrated a relationship which has lasted 19 years. Datacraft has just announced the Australian release of Micom's latest voice/data integration product, the Marathon 10K, a management software package called NETMan and a new Voice/Fax/Modem module for the 10K.

The Marathon 10K is 100% compatible with earlier 1K and 5K products, and comes in two basic configurations. The 'Feeder' configuration integrates voice, fax and data services over a single composite link of up to 128Kbps, while the 'Feeder/Switch' configuration acts as a hub for a Marathon-based WAN of up to 250 nodes, in addition to providing local integration services. The 10K Feeder/Switch configuration provides up to 12 WAN links. Both units can integrate a maximum of 41 async data channels, 12 sync data channels, and eight Voice/Fax/Modem channels (via the Voice/Fax/Modem module), and a local Ethernet connection is provided with the Remote LAN Bridge option which provides a standard IEEE 802.1d-compliant Ethernet remote bridge.

A terminal server option is also available. This option provides TELNET, rlogin and DEC LAT support. It boots locally from a proprietary Marathon DVNS FeaturePak software cartridge. Software can also be downloaded from a Micom NETMan management workstation. NETMan software resides on an SCO UNIX System V/386 platform running Release 3.2.4 or later.

Micom's Marathon family uses a combination of sophisticated compression algorithms and modulation techniques (transmitting faxes in digital rather than analogue form, for example) to permit the compression of voice channels to between 4 and 16Kbps and faxes at their digital bandwidth (rather then a full 64Kbps PCM channel).

Unlike most voice/data integration products on the market, the Marathon family uses a combination of cell relay/fast packet multiplexing to provide dynamic bandwidth allocation. The beauty of such an approach is that in most offices there is little voice and facsimile traffic outside business hours, leaving the total bandwidth of the WAN link available for network traffic, and making remote software updates, e-mail transfers, backups and other housekeeping tasks possible. This makes the Marathon family particularly attractive to network administrators who must justify the cost of their WAN links on the basis of sharing links with voice and fax traffic.

PRODUCT SUMMARY

Name: Marathon 10K; Voice/Fax/Modem Module; Remote LAN Bridge Module; Remote Terminal Server Module; NETMan Management Software

Description: Micom's family of voice, fax and data inegration products and associated software

Price: Marathon 10K (ex Feature Pak) $12,600 as Feeder, or $15,500 as Switch/Feeder; Feature Pak Modules for Marathon family $200 to $1,000
Voice/Fax/Modem Module — Single Channel $3,500; Dual Channel $5,500
Remote LAN Bridge Module $3,600
Remote Terminal Server Module $6,000
NETMan Management Software (10 User) $2,100, (Unlimited) $5,200

Vendor: Micom Communications

Distributor: Datacraft Australia Pty. Ltd.
PO Box 353, Croydon VIC 3136,
Tel: (03) 727-9111

In fact in many cases Micom's products would appear to be more cost effective than technologies such as ISDN which, while able to allocate channels dynamically, allocate fixed bandwidths. The voice data integration technology Micom builds into its Marathon family is not only clever and efficient, it is very appropriate for Australian conditions, and, for that matter, conditions in much of the Asia Pacific region.

For those considering the deployment of distributed systems based on PC network technology, particularly where numbers of small branches are required, the Marathon family could represent the difference between implementing the system now, and being able to offer local services to customers; or shelving the project for several years.

Graeme Le Roux

Managing Virtual Private Networks

Infonet's Perspexion family is looking to give net managers an on-line view of their VPDNs.

These days, just about every international VAN operator is trying to tempt corporate customers with alternatives to private data networks — most often a virtual private data network (VPDN) on a shared backbone. But going virtual has a serious shortcoming: There's virtually no way to monitor activity on a VPDN, so net managers remain blissfully ignorant of problems until a call from an irate user brings them back to earth (with a very real thud).

With its Perspexion family of network management services, Infonet is trying to make sure its customers don't have so far to fall. Perspexion Link, which is already available, delivers daily, weekly, or monthly reports on a customer's virtual network, either as faxes or as e-mail. More significant offerings are slated for the fourth quarter, when customers will be able to use consoles at their own sites to access Infonet's network management systems in El Segundo, California.

Once customers can go on-line with net management, they'll be able to keep a close watch on the status of their VPDNs and track the progress of Infonet trouble tickets. And that should go a long way towards letting network managers spot problems before end-users are aware of them.

Two versions of the console-based service are planned. The first, Perspexion Vision, is for virtual networks based on Infonet offerings such as its X.25 packet-switched network or its Infolan LAN interconnect service. The second, Perspexion Manage, is for keeping tabs on hybrid networks comprising both Infonet services and private networks that were previously operated by customers. And Infonet indicates that its long-term strategy is to extend Perspexion beyond the wide area, to LANs, equipment at customer sites, and applications.

The Underlying Platform

Underlying Infonet's new services is its adoption of a single network management platform to oversee the various elements of its own backbone, which includes multiplexers from Network Equipment Technologies and routers from Wellfleet Communications, among other equipment. The platform Infonet chose, which comes from Maxm Systems, meets Infonet's requirements in two respects.

First, Maxm's client-server architecture enables Infonet to accommodate hundreds of remote network management consoles at customer sites. These consoles (486-based PCs running OS/2) are loaded with client software that Infonet will configure and supply. Customers will see only their own virtual network, not the entire backbone. The server software runs on IBM RS/6000s in Infonet's network control centres.

Second, Maxm's platform offers a relatively straightforward way for the VAN operator to incorporate equipment that customers are already using. Maxm already has a wide range of interfaces available for a variety of networking gear, as well as for industry-standard management systems such as IBM's NetView, HP's OpenView, and SNMP management systems. Moreover, Maxm's rules-based management platform is easy to customise. No special programming skills are needed to modify rules or write new ones, which are generated via a graphical user interface. The Maxm system can interpret streams of management data coming in from different devices, filtering out unwanted information and correlating it with management data from other devices before generating alerts.

PRODUCT SUMMARY

Name: Perspexion

Description: Family of network management services for Infonet networks

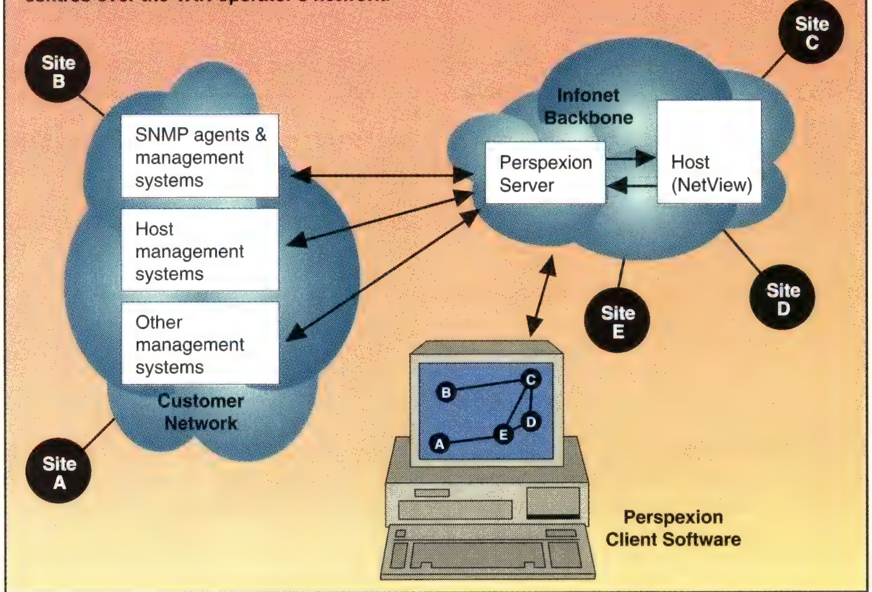
Price: Perspexion Link costs around $430 per month for an average network; Perpexion Vision costs around $1,450 for an average network; Perspexion Manage costs can vary depending on equipment configuration

Vendor: Infonet Services Corporation, 10 LaTrobe St, Melbourne, VIC 3000.
Tel: (03) 664 9380

Infonet has already brought its own network equipment under Maxm's centralised management, which is how the VAN operator generates the reports offered with its Perspexion Link service. These reports, which help users with capacity planning, budgeting, and performance tracking, are divided into three sections. Part 1 indicates network activity at each customer site, including peak throughput in terms of kilobits and packets per second, along with overall volume, packet size, utilisation, error rate, and drop rate. Part 2 gives a log of trouble ticket activity, including the priority level assigned to fixing the fault; the person reporting it; the date and time the ticket was opened, updated, and closed; and the cause of the fault. Part 3 lists planned maintenance

Perspexion in Perspective

Perspexion services will soon be able to monitor the status of virtual and hybrid networks. Client software loaded into customers' PCs will communicate with Infonet's network control centres over the VAN operator's network.



— for instance, giving users advance warning of the date, time, and location of a switch that will be taken out of service for a software upgrade.

Trial customers of Perspexion Link give it high marks, with users reporting the system gives them more information than they get on their own private networks.

Coming Perspexion services will monitor the status of virtual and hybrid networks (see figure). To do this, the client software loaded in customers' PCs will communicate with Infonet's network control centres over the VAN operator's network. On the customer's screen, the virtual network is represented by circles at each site (representing cities), which are connected by lines. The circles turn from green to red in the event of a failure. By pointing and clicking on the circle, further details can be seen, including local circuits and CPE such as routers.

Failed equipment is shown in red. Pointing and clicking again reveals further levels of detail, such as a diagram of the diagnostic lights on the back or front of the piece of equipment, with the failed card coloured red. Another click reveals the ports on the card, with the failed ones once again indicated in red. Users can click on the ports to open a window that shows the date and time of the event causing the failure. Customers also can interrogate Infonet's database to check the progress of trouble tickets. Since the client software supports Microsoft's Dynamic Data Exchange (DDE) interface, the data generated by Infonet's network management service can be shipped to other DDE-compliant Windows or OS/2 applications, such as spreadsheets or bar charts.

According to Kevin Ziebell, Infonet's Australasian Manager, Perspexion Link costs $430 a month for a typical network. He says Perspexion Vision will cost about $1,450 per month, while the price of Perspexion Manage will depend on what customer equipment is being managed.

Links With Microsoft

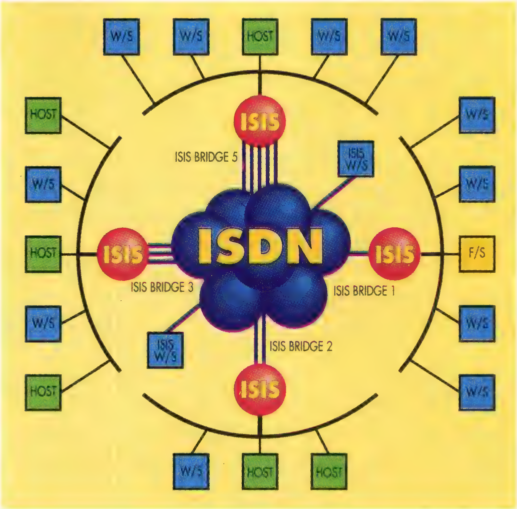
In the long run, Infonet expects to put Perspexion to work managing services at customer sites, so that it can beef up its global outsourcing efforts. Infonet's alliance with Microsoft aims to integrate Perspexion into Microsoft's Hermes workstation management system, scheduled for launch late this year. The DDE interface already in the Maxm software should facilitate this integration. With Perspexion linked to Hermes, Infonet hopes to be able to take on some more system management tasks, distributing software or conducting inventory audits on global enterprise networks, for example. Infonet also plans to use its Maxm platform to add more value to its existing services, offering security services to potential customers through another alliance, this time with Semaphore Communications.

Peter Heywood

ISDN Technology Update
Merging ISDN with LAN Technologies

Essential Features: ISDN Access Servers

- Integrated system. Modular and scalable from 1 to 5 Microlinks.
- On-demand concurrent multipoint and point-to-point call profiles.
- On-demand channel aggregation from 64Kbps to 640Kbps.
- On-demand automatic call setup and knock-down with tenacity.
- MAC layer bridging and protocol sensitive link management.
- Call profile security with dial back and CLIP triggers.
- Remote and local management with built-in protocol analyser.
- Protocol transparent with broadcast and source address filtering.
- Call tenacity, auto call maintenance and ISDN fault recovery.
- Workstation drivers compatible with NDIS, IPX, etc.
- Low cost (<$3k workstation, <$6k Bridge 1 System.)
- Austel approved for connection to Microlink.



ISDN topologies offer high speed concurrent access to multiple other ISDN connected services on demand.

ISDN's promise of high speed digital connections between workgroups is now delivered.

- Around the world or just around the city, the ISIS LAN Access Server family offers reliable, manageable and cost effective LAN to LAN and workstation to LAN access at speeds ranging from 64Kbps to 640Kbps, on demand!
- Designed from the top down to provide integrated and expandable pure digital connections at the MAC layer, ISIS also includes built-in security and management.
- The **ISIS LAN Access Bridge** is ideally suited for WAN and backbone router integration, remote site access, E-mail and mainframe access over LAN protocols such as IPX, IP, OSI CLNS, DECnet, Vines, XNS, etc.
- The **ISIS Workstation** provides the ideal platform for single station remote access to other peers and LAN systems in a telecommuting environment.
- For further information on ISIS LAN Systems, simply copy your business card onto this page and fax it to Network Designers Asia Pacific Group Headquarters.

NETWORK DESIGNERS KNX

Network Designers kn-X Advanced Systems Group.
Level 9, 22 Williams Street, Melbourne. VIC 3000. Australia.
Phone (03) 629 3800. Facsimile (03) 629 5791.

Reseller, System Integrator and Dealer enquiries are welcome.

IBM Gets a New Look at the LAN

Protools' network management software provides RMON MIB data and Ethernet alerts to IBM LAN Manager and NetView.

IBM makes great network management tools — but only for IBM gear. When it comes to gathering SNMP data from Ethernet and Token Ring LANs, users of IBM's net management packages are out of luck. That's where Network Control Series software from Protools comes in.

The OS/2-based software gathers data from SNMP remote monitoring management information bases (RMON MIBs) and sends the information along to IBM's LAN Network Manager and NetView. Those capabilities give Protools a couple of firsts: the software is the first to allow LAN Network Manager to receive Ethernet alerts and it's the first to enable LAN Network Manager and NetView to display RMON data.

There are two parts to the Network Control Series. The Cornerstone Agent monitors traffic on individual Ethernet or Token Ring LAN segments, and the Foundation Manager consolidates information from up to 256 local or remote Cornerstone Agents (see figure).

Both software packages use SNMP to monitor packet activity on LANs. The packages make it possible for any adaptor card compatible with the Network Device Interface Specification (NDIS) to continuously filter network traffic.

Adding Analysis

Besides supplying data to IBM management systems, the software allows network managers to develop proprietary network analysis applications and reports. The Protools products also contain network analyser software to assist developers in writing custom applications.

As for the products' MIB capabilities, the software supports all nine groups of the Ethernet RMON MIB approved by the Internet Engineering Task Force (IETF). Protools has written its own RMON extensions to monitor Token Ring traffic; the IETF is still in the process of approving standardised Token Ring RMON MIB definitions. The vendor says it will support the IETF spec once it's completed.

Users select thresholds to flag specific network conditions or traffic levels in either package, and can decide themselves where to set these thresholds. Alternatively, the Foundation Manager also comes with an automatic baselining feature that determines network conditions by sampling traffic patterns. Net managers can use this feature to determine how thresholds are set.

If thresholds are exceeded, the Cornerstone Agents notify the Foundation Manager. Network managers can then activate a range of responses to any alert, including activating an audible or visual alarm; launching an OS/2 program from the machine on which Foundation Manager resides; or sending an SNMP trap to the Foundation Manager or another SNMP-based management system.

In all, the software defines 52 types of Ethernet and Token Ring alarms, based both on standard RMON definitions and the vendor's extensions to the RMON spec. These alarms signal LAN problems such as frames dropped, collisions, jabber, and beaconing.

With this release, Protools also offers the option of sending alerts to IBM's LAN Network Manager and, from that system, on to NetView. To send an alert to an IBM net management console, Foundation Manager translates any of the 52 Ethernet or Token Ring alarms into IBM's NMVT (network management vector transport) format.

One possible drawback of the Protools software is the amount of information it passes along to IBM consoles. While the software does send alerts to IBM consoles, users often must refer back to the Protools Foundation Manager to get more detailed information about those alerts, such as a description of an error, the date and time it occurred, and its probable cause. Protools says future releases of the software will display detailed information as secondary screens on LAN Network Manager and NetView.

In addition, the vendor is working with IBM on software that would let LAN Network Manager or NetView send commands to the Protools Foundations Manager in response to specific alerts; again, no release date has been set. This might be useful, for instance, if NetView or LAN Network Manager received notification of slow response time on a LAN segment and a net manager wanted to use the Protools monitoring products to isolate the cause.

Mary Jander

PRODUCT SUMMARY

Name: Foundation Manager 1.3 and Cornerstone Agent 1.3

Description: OS/2 network management software that passes information about Ethernet and Token Ring LANs to IBM's LAN Network Manager and NetView

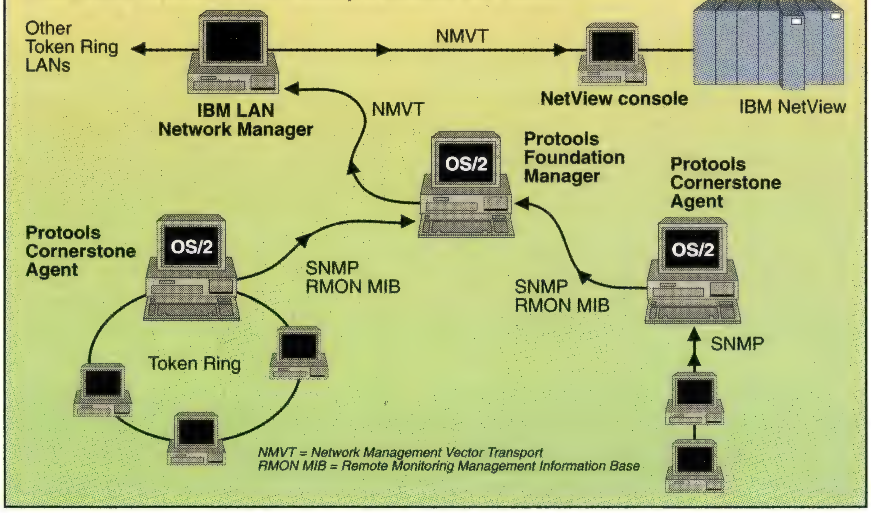
Price: Foundation Manager $20,600; Cornerstone Agent $2,900

Vendor: Protools

Distributor: Ungermann-Bass, Level 2,
312 St Kilda Rd, Melbourne VIC 3004
Tel: (03) 693 8200

Bringing RMON to SNA Consoles

Protools' Foundation Manager accepts RMON MIB data from up to 256 Cornerstone Agents residing on Ethernet and Token Ring segments running under OS/2. Foundation Manager, in turn, passes alerts to IBM LAN Network Manager and NetView.

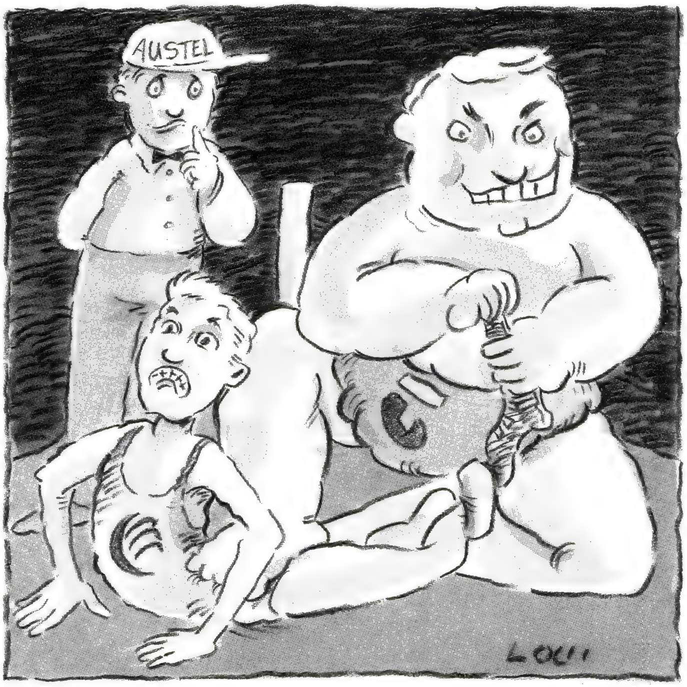


NMVT = Network Management Vector Transport
RMON MIB = Remote Monitoring Management Information Base

Mobile Dominance on the Move

After a lengthy examination, Austel has ruled that Telstra remains dominant in provision of mobile phone services. Peter Leonard backgrounds and reviews this ruling.

In July Austel completed its investigation as to whether Telstra (Telecom) is dominant in the market for public mobile services. Austel concluded that Telstra remained dominant, confirmed its earlier ruling requiring Telstra to charge on tariff, and also required it to make arrangements to pay back charges levied on those customers who were charged, and made, off-tariff payments.



Dominance is relevant in a number of regulatory contexts. Both carriers must file a tariff for any basic carriage services offered by them. While the non-dominant carrier is able to strike 'off-tariff' deals, a dominant carrier must charge in accordance with its tariff. In addition, a dominant carrier is not entitled to discriminate in its tariff between different customers except in specified and limited circumstances.

Another regulatory context for assessing 'dominance' — although not relevant to Austel's report — is that the interconnect pricing principles dictated by the Government cease to apply at certain traffic share 'trigger' points or when Telecom ceases to be dominant. Clearly, dominance is a major commercial issue for the carriers.

Do it Yourself Regulation

One feature of the *Telecommunications Act* is that Telstra does not require Austel to approve or to consent to Telstra's views in relation to dominance before it acts on them. In April, Telstra wrote to certain customers who had churned from MobileNet to Optus Mobile offering 'significant discounts over and above our standard tariffs,' 'in consideration for Telstra MobileNet recovering your business in its entirety.' One option offered was three months' calls and access charges free in return for a two year contractual commitment.

When Optus became aware of these offers it requested Austel to direct Telstra to charge only in accordance with its tariff. On 14 May Austel directed Telstra to cease offering charges off-tariff or offering special deals to customers who churned to Optus Mobile.

The Market

Austel had little difficulty in construing the relevant market in the context of its investigation as being 'the Australia-wide public mobile telecommunications service (PMTS) provided either by analogue AMPS or digital GSM technology.' Austel could not identify 'any existing combination of telecommunication services which could be mix variable with PMTS,' so as to justify a wider market definition in the context of this particular inquiry, although noting that 'a number of telecommunications services are complementary, not substitutes, to PMTS on the supply side.' Complementarity on the demand side was found relevant to construing dominance, as discussed below.

Austel did give consideration to a functional construction of PMTS to create two distinct and separate markets: wholesale (AMPS airtime to retail MobileNet and Optus and potential wholesaling of digital GSM by Telstra, Optus or Vodafone to resellers), and the retail market. Austel concluded that 'whilst there are two functional levels within the PMTS market, there is no functional split to create two separate markets.' It also noted that regulation precluded analogue AMPS wholesaling prior to 1995 and the limited competition from GSM in the interim period ensured Telstra's continued dominance of the wholesale level.

Having identified the relevant market, Austel turned to consider whether Telstra was dominant in that market.

Competitive Restraint

First, Austel considered whether Telstra had power to act without significant competitive constraint. It concluded that Telstra currently had this ability, in part derived from its ownership of the analogue AMPS network and the infancy of digital GSM services.

In particular, Austel noted that Telstra derived significant benefits of economies of scale and scope on the AMPS network. Payment of fixed wholesale prices by Optus to Telstra meant that Telstra was guaranteed a set margin notwithstanding price pressure at the retail level. Wholesale profitability was in fact increasing both through increased capacity of the AMPS network from technical advances such as improvements in control software, and both Optus and MobileNet's marketing efforts expanding the AMPS retail market.

This advantage could be magnified in the absence of any regulatory accounting separation between Telstra's airtime wholesale and retail operations. Austel concluded that the absence of any such separation was a defect in the existing chart of accounts/cost allocation manual (COA/CAM) requirements. It now proposes to amend the COA/CAM to require accounting separation between Telstra wholesale and MobileNet retail.

Austel also noted that Telstra derived significant marketing advantages from the price-related break in substitutability between AMPS and GSM due to the difference in price of handsets, slowing the introduction of constraining competition to Telstra from digital GSM. Telstra also obtained leverage from its position in the fixed network and distribution channels, and in particular through tariffing options such as SPAs which 'give rise to an asymmetrical opportunity which has the effect of raising rival's costs. By locking in the large customers a competitor will have to obtain a number of small customers to obtain an equivalent number of services in operation of the large customer. The cost of obtaining a number of small customers in terms of marketing and sales costs will be greater than that of obtaining one large customer thus increasing the average acquisition cost per service in operation.'

Telstra also has access to 'a significant history of customer-based information gathered during the period when it held a monopoly in the PMTS market' which can be used 'to target more accurately and effectively its marketing and customer service efforts.' Austel also noted that Telstra exclusively derived the revenue stream of premium rates on calls originating in its fixed network and terminating on mobile phones.

Austel also contrasted price history in mobile services and other services. It concluded that MobileNet had sustained a price differential over Optus and only in limited circumstances had undercut Optus' tariff prices with tariff packages aimed at selected customer groups. This was in contrast to what Austel considered was more vigorous price competition in relation to fixed network long distance and international services and 'may be attributable to Telstra considering itself to be less constrained in the PMTS market.'

Austel's *Market Dominance Guidelines* discussion paper noted that the extent of product differentiation to be a relevant factor in construing dominance. It concluded that while Optus was reselling airtime on the AMPS network 'neither carrier is able to differentiate its services on the grounds of functionality, coverage or technical quality.' Such differentiation as does occur comes about solely as a result of Telstra's choice as to when innovation or differentiation is appropriate.

It noted that Optus has complained that Telstra was taking longer to connect Optus customers than MobileNet customers and that this was subject to a separate investigation.

Regulation Flip-Flop

Austel next considered the extent to which regulation precluded or limited dominance. The price cap and price control arrangements were not considered to 'unduly restrict [Telstra's] pricing choices for mobile services,' given that mobile charges fell within broadly defined baskets of services and were not subject to sub-caps. Although the Interconnect Agreement was subject to Austel review, the agreement did not relevantly constrain Telstra, as it did not relate to conduct or behaviour at the retail level of the market or as between Telstra and any party other than Optus.

As to general regulation by Austel (for example, Austel's power to issue directions to all carriers), it noted that 'general regulatory factors do not significantly inhibit Telstra and all carriers are subject to regulatory constraints which do not impact this examination.'

Austel noted the possible conundrum, which it colourfully described as 'dominance flip-flop,' which arose from the argument that one effect of dominant carrier regulation was that a carrier was not in the position to dominate because of the restraints imposed. Austel noted that this would lead to 'an absurd circular argument' to the effect that while a carrier observes the constraints it is not in a position to dominate a market, but as soon as it ceases to observe them it is in a position to dominate a market. Accordingly, Austel noted the relevance of regulatory constraints on a dominant carrier, but said that they should only be given 'a low weighting.'

Barriers to Entry

The next area considered by Austel was the extent of barriers to entry. The primary barrier noted was that only Telstra was permitted to construct or operate an AMPS network before 30 June 1997. Other factors included the tying of the majority of large dealers to MobileNet, the tying of the majority of all dealers to either Optus or Telstra (thus limiting the available distribution network to a new entrant), and the cost of changing from AMPS to GSM limiting the extent of competition from GSM.

Strategic barriers to entry also arose out of Telstra's safe revenue base in AMPS wholesale margins; its access to customer-based information; its control over analogue AMPS service enhancement and development; and its significant control over customer service levels generally. These barriers were re-enforced by 'lock-in' of large customers through strategic partnership arrangements, and Telstra's strategic advantage in determining when, how and to whom it marketed migration from analogue AMPS to digital GSM.

Economic Approach

Little can be said concerning Austel's analysis of market share, as most of this area of the report is confidential. However, it is interesting to note that Austel reviewed market share as 'an indicator of the existence of market power,' or 'evidence' of market power, rather than in itself defining that power. This approach is consistent with Austel's emphasis throughout the report on analysing and weighting specific economic and marketing advantages which accrue to Telstra over its current or prospective competitors. This reflects the trend of recent anti-trust and trade practices cases in Australia and elsewhere towards adopting a more rigorous economic approach to analysing factors which give rise to market power in general and dominance in particular, instead of mechanistic and formalistic construction of the market and substantial reliance upon market share as the key indicator of market power.

The difficulty in applying the economic approach directly derives from its comprehensiveness: with an extensive catalogue of matters for consideration, how are these to be weighted or balanced? The courts in anti-trust cases have been at pains to state that each case depends on its facts and to reject universal or formal weighting of criteria. Austel clearly heeded this caution, and did not specifically rank the matters referred to above.

Instead, its summary points to four broadly based factors which it considered predominant in reaching its conclusion, being:

- Telstra's exclusive ownership of the analogue AMPS network, leading to ability to act without significant constraint, barriers to entry and Telstra control of product differentiation;
- Leverage which Telstra can obtain from its ownership of the PSTN and 'whole of business' service operations;
- Asymmetrical market opportunities, which give Telstra the potential to act without significant constraint; and
- The level of market share held by Telstra, 'which may be an indicator of the existence of market power.'

Optus' ruling is of course of particular interest in the context of the current Optus/Telstra litigation. The court in that litigation will similarly need to construe the relevant telecommunications market or markets and to consider whether Telstra is dominant in relation to supply of various kinds of telecommunications services. The complexities of analysis for mobile services will be correspondingly greater as the focus of examination moves to include fixed network services. Austel's report represents but the tip of the iceberg in regulatory analysis of dominance.

Peter Leonard is a partner with the Sydney technology law firm Gilbert & Tobin and specialises in telecommunications and information technology contracting and regulation. He was involved in preparation of Optus' submission to Austel and his firm acts in the Optus/Telstra proceedings. This column sets out his views and not those of Optus or other clients' of his firm.

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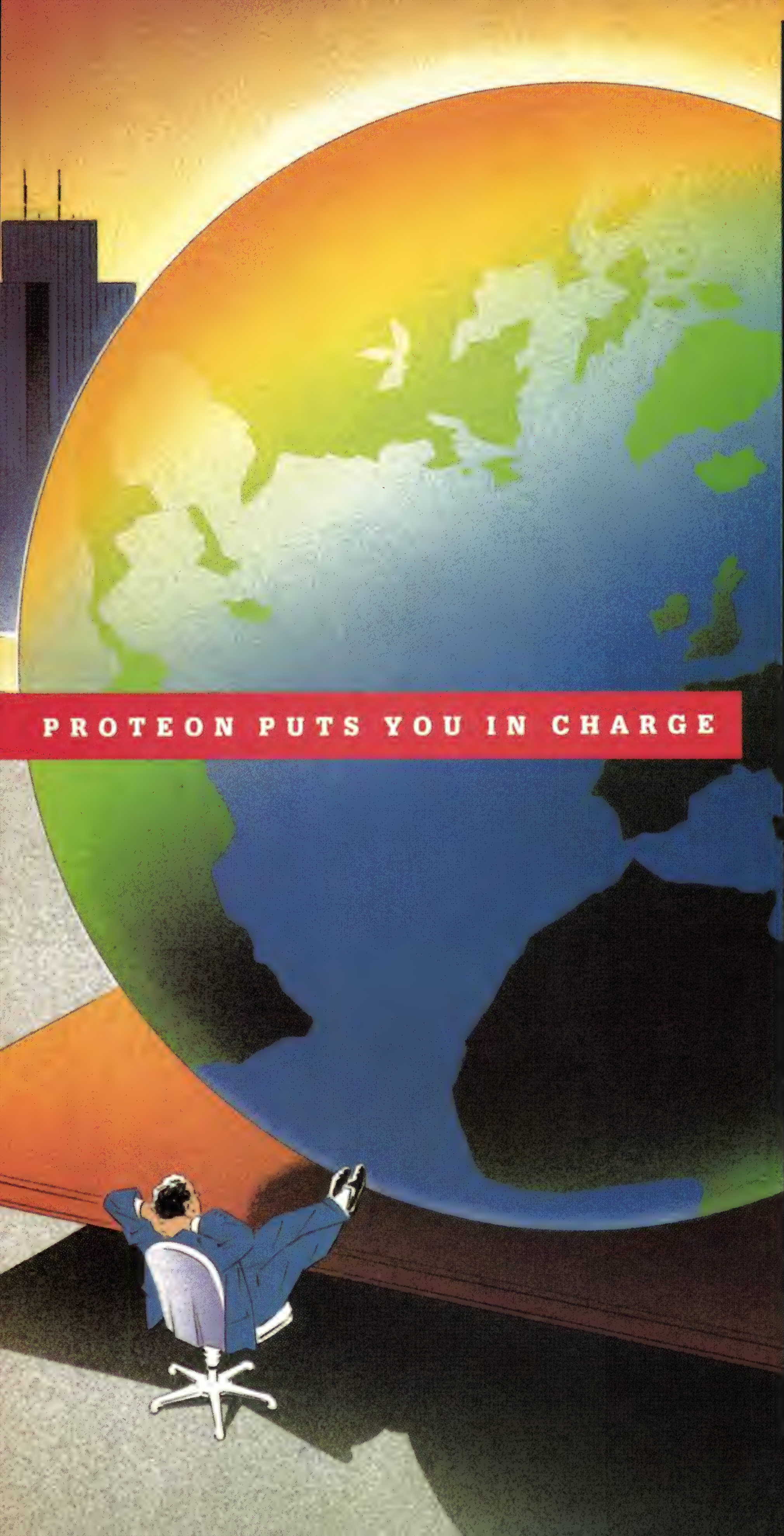
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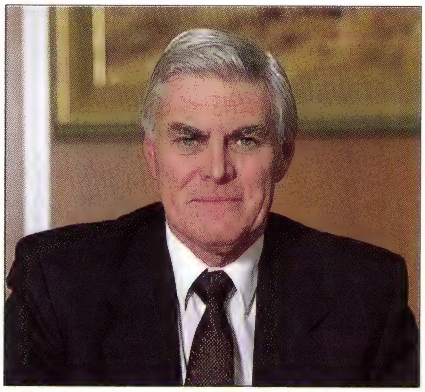
Alcatel — Driving Australia's Export Industry



Bill Page-Hanify

Chairman and Managing Director, Alcatel Australia

Bill Page-Hanify sits at the helm of Alcatel Australia Ltd, a member of the Alcatel N.V. group, which is the largest supplier of telecommunications systems in the world. He joined the company (then Standard Telephones & Cables Pty Ltd) as a Senior Engineer in 1960, became General Manager, Electronic Switching and Marketing Director during the 1970s, and was appointed Managing Director in 1985 and Chairman of the Board in 1987. He is a Fellow of the Australian Academy of Technological Sciences and Engineering and has degrees in Economics and Engineering from the University of Queensland. Liz Fell spoke with him at the headquarters of Alcatel Australia in Alexandria, Sydney.

This must be a crucial time for Alcatel with Telstra tenders for both switching and transmission up for grabs. What happens if a worst case scenario occurs and you lose both contracts?

Page-Hanify: We have never even thought about losing!

AC: *The switching side is big business for you . . .*

Page-Hanify: It is our largest business.

AC: *How long has the company been involved in the Australian switching market?*

Page-Hanify: Our earliest business was in switching back in 1895 or 1896 when we were Western Electric. We started manufacturing switching here about 1945-1946. In fact, we have just built the third new switching factory in my 30 years with the company.

The building opposite here was built about 1961 to make crossbar switches. Then we built another down the road to make 10 C, our first stored processor controlled exchange. Now we've got a brand new third factory at Liverpool for the Alcatel System 12. So you can see how the switching business has influenced company growth.

AC: *Was it hard work to win the latest System 12 contract?*

Page-Hanify: Winning a contract is always hard work. We were up against AT&T, Northern Telecom, GPT, Fujitsu and so on.

AC: *How many System 12 lines have you installed so far?*

Page-Hanify: Over 300,000 lines here in Australia, and about 24 million around the world.

AC: *Did the contract have a time limit?*

Page-Hanify: It was awarded for three years, extendable up to ten years.

AC: *So Telstra's decision to reduce the number of switching suppliers coincides with the end of the first three years?*

Page-Hanify: Yes.

AC: *What other switching manufacturing facilities does the Alcatel group have in Asia?*

Page-Hanify: There is one in Taiwan and another in Shanghai. We are the largest of the three.

AC: *So if you lost this tender, would there be any point in keeping the Australian factory? Would you close it down?*

Page-Hanify: It always sounds like a threat to say: 'We'll close it down.' It's self-evident though, if you don't have any work!

AC: *Haven't you recently won a System 12 export contract to China?*

Page-Hanify: Yes. We have nearly 400,000 lines on order in China. That will involve us in manufacturing, supplying and in training engineers.

AC: *Why can't that be done by the Alcatel factory there?*

Page-Hanify: Alcatel has the largest manufacturing plant in China, but it can't cope with the demand which will amount to 10-12 million lines next year. Other Alcatel companies from around the world are also supplying System 12 into China such that at least 40% of the market is now System 12. It's an enormous market. China has about one phone per 100 people. We have about 48 per 100 in Australia. So you can see the growth prospects. The Chinese will increasingly supply their own switching, but in the meantime it's quite a substantial export opportunity for those who can compete.

AC: *You have also won Telstra's GSM network supply contract for Sydney and Brisbane. Will there be more opportunities in the mobile sector?*

Page-Hanify: Definitely. GSM is in the capital cities only at present, so there's more coverage needed — apart from ordinary growth. We're also in India with Telstra on a GSM licence and we're working on several export projects.

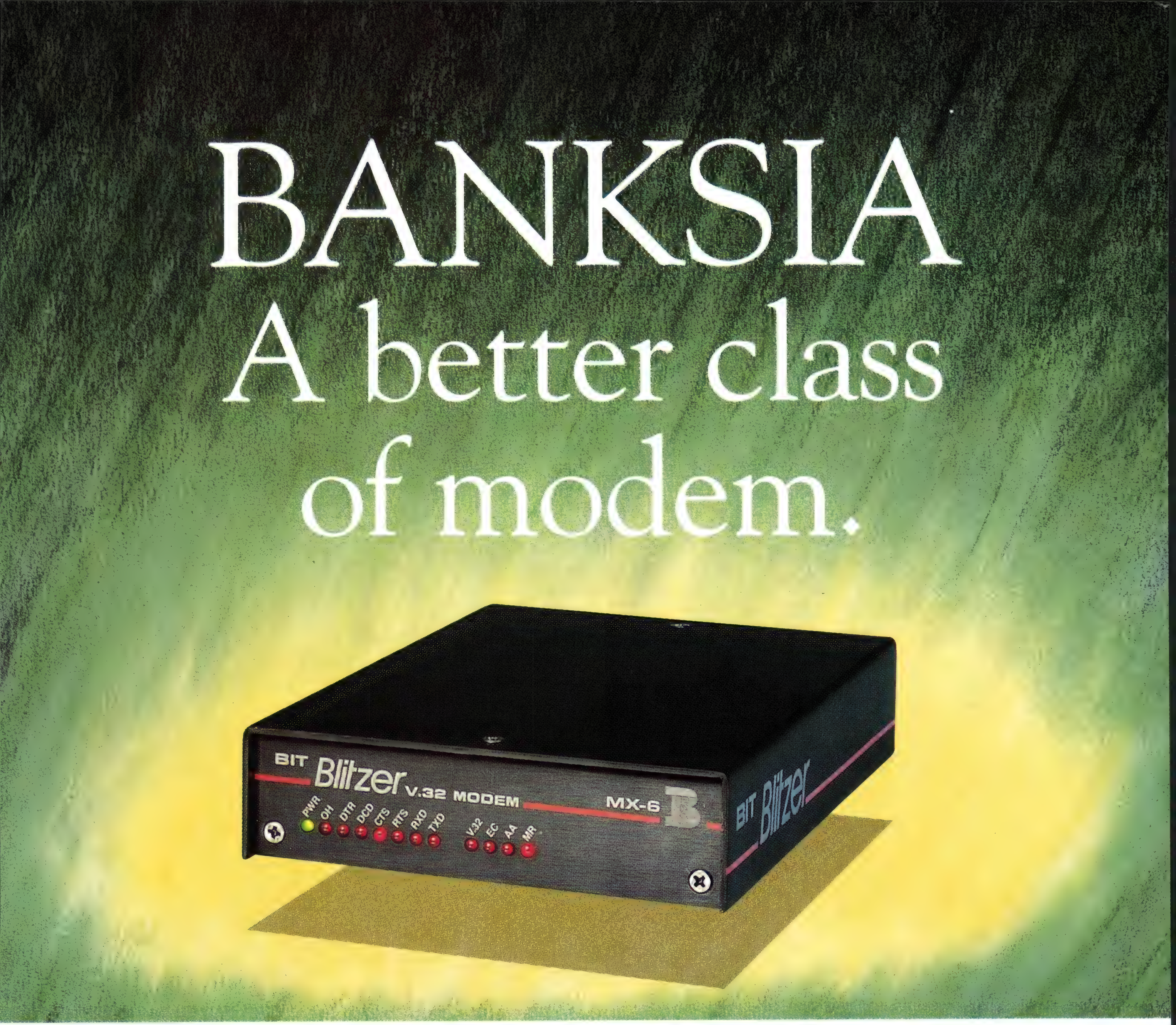
AC: *What about the terrestrial transmission segment of your business?*

Page-Hanify: We've been very big in the now declining PDH [Plesiochronous Digital Hierarchy] transmission systems. I guess about half the long-haul systems in Australia have come from us. We've also sold them into Pakistan and New Zealand.

AC: *And you are one of four suppliers selected to trial SDH [Synchronous Digital Hierarchy] transmission technology with Telstra?*

Page-Hanify: Yes. For the trials, we did quite a degree of the engineering R&D work with other Alcatel companies and designed several ASICs [Application Specific Integrated Circuits] in Australia. Alcatel doesn't have central R&D laboratories at headquarters. They're distributed around the major manufacturing companies. So in the development of SDH, we work with companies in Milan, in Paris and in Stuttgart.

At any one time, we have a minimum of probably 50 engineers working overseas on various R&D projects, and in total approaching 400 engineers working on R&D



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in Australia. So we have a very mobile workforce who move from research group to research group as required.

AC: *If you become one of Telstra's two transmission suppliers, what will SDH technology mean in terms of investment here?*
Page-Hanify: SDH requires many millions of dollars of test equipment and manufacturing plant. What it really means, of course, is that Australia becomes a leading-edge supplier in the latest and greatest in transmission. The major change with SDH is that the same big software element that's in switching development is now in transmission also.

AC: *When your Tasman Cable Company [TCC] won the PacRim submarine cable contracts, you aimed to win exports of more than $1 billion over ten years. How are you going with that?*
Page-Hanify: We're ahead. We've actually doubled our capacity compared with what we said we would do originally.

AC: *Is that based on winning contracts for the SEA-ME-WE2 and Unisur cables since winning PacRim?*
Page-Hanify: Yes. We're over $500 million on our way to that $1 billion target. We'll clear that very easily.

AC: *When Alcatel TCC was first announced, 40% was to be owned by Australian and New Zealand companies. Didn't the NSW Government get a share in return for the land at Port Botany?*
Page-Hanify: They considered it, but we leased the land instead.

AC: *What happened to the 40% Australian and NZ ownership?*
Page-Hanify: The option was for 40%. OTC and Telecom NZ had an option, but neither of them took it up and so the original shareholding of one third each Alcatel Cable, Alcatel CIT and Alcatel Australia has prevailed.

AC: *Alcatel TCC won a portion of the SEA-ME-WE2 contract along with several other Alcatel cable companies. How do you decide which cable companies get certain jobs?*
Page-Hanify: In the case of submarine systems, we've got the two major manufacturing plants for submarine systems in Calais and in Sydney and other plants in Norway and in Greece. Alcatel Submarcom, our marketing arm, is a group financed and run by all the submarine cable manufacturers and it's charged with winning contracts for Alcatel. Now we have acquired STC Submarine Systems of the UK, I expect it will also come under that Submarcom banner.

AC: *So Submarcom made the bid for the SEA-ME-WE2 cable contract on behalf of the Alcatel submarine cable manufacturers?*
Page-Hanify: Yes. It won a proportion for Alcatel and then decided on the allocation.

AC: *Do you represent Alcatel TCC on the Submarcom board?*
Page-Hanify: Yes.

AC: *So is it like a happy family where you farm out the work to the various plants?*
Page-Hanify: It's generally fairly straightforward because it involves asking: 'Where is the manufacturing capacity at a certain time?'

AC: *As you mentioned, Alcatel has just acquired Northern Telecom's STC cable facilities in the UK and US. Do you anticipate some rationalisation following this latest purchase?*
Page-Hanify: Well, they've all been working at pretty close to capacity for a few years now.

AC: *Would you expect Alcatel to keep the manufacturing facilities in both the UK and France, for instance?*
Page-Hanify: I can't comment on that.

> *"The world scene is obviously changing to larger groups and it's the imperative of research and development costs that is driving this."*

AC: *But if there were to be some rationalisation, then the question must be asked as to whether Alcatel TCC's Sydney facilities are at risk?*
Page-Hanify: Goodness, no. Definitely not.

AC: *Is that because Alcatel TCC is the only Alcatel manufacturing facility in the Southern Hemisphere?*
Page-Hanify: Because of its geographic position, because of its efficiency, everything. But what will come out of this merger is our greater ability to fund the R&D which is becoming enormously expensive for submarine systems because, as on the land, we're moving from the current generation of optical systems to optical amplified systems. That's a big step.

AC: *Certainly this recent acquisition must place Alcatel in a dominant position in the expanding submarine cable market. What is left in the way of competition?*
Page-Hanify: Our competitors are AT&T and OCC, a Japanese consortium. But we're number one in the world.

AC: *Do you see this consolidation among global equipment suppliers continuing?*
Page-Hanify: The world scene is obviously changing to larger groups and it's the imperative of research and development costs that is driving this.

Alcatel's formation in 1987 through the merging of ITT and the CGE [Compagnie Generale d'Electricite] companies was part of this trend. That took Alcatel from eleventh largest in the world to about number two or three. Since then Alcatel has bought the Telettra transmission business in Italy, the communications part of Rockwell in the United States, Canada Wire and Cable, AEG Kabel in Germany and now STC Submarine Systems, and a number of smaller acquisitions on the way. That's taken Alcatel to number one.

AC: *Number one in what sense?*
Page-Hanify: In terms of supplying telecommunications equipment. The whole imperative of all this is the cost of research and development which goes up and up. It can only be supported by very large companies with a complete product spread because it's exceptionally difficult to remain a leader in just one segment of telecommunications. That's why Rockwell and Telettra became available, and why STC in the UK was originally bought by Northern Telecom.

AC: *And Alcatel has this 'complete product spread'?*
Page-Hanify: That's right. The convergence of different branches of communications — terminal equipment, transmission links and switches — is probably the most significant thing happening in this decade. We've got options that we've never had before as to where we put the intelligence. If a company is to be successful, it has to have all those options. In the case of Alcatel Australia, we're the only company here that has this end-to-end capability. In fact, there are very few companies in our entire industry that have this.

AC: *Given the trend towards consolidation on the equipment supply side, one option is for the large suppliers to enter the carrier or service side. Am I right that Alcatel considered this at one stage?*
Page-Hanify: We have no strategic objection to moving into service provision except that we have always, and will always, make it clear that we will not do this in competition with our customers.

AC: *If Alcatel were to lose the Telstra supply contracts, wouldn't it be well-positioned to compete in the enhanced services business using its own equipment?*
Page-Hanify: I think the company should 'stick to its knitting' and should no more go into setting up telephone companies than they should go into manufacturing and designing.

AC: *But some telephone companies are already involved in manufacturing.*

Page-Hanify: Only AT&T and Bell Canada. But overall we have no inhibition in this area and, you're right, there has been talk of Alcatel investing in telephone companies. It hasn't come to anything, but the options are there and, certainly, in newer services and so on, it's always on the cards.

AC: *If you are doing most of the R&D or software development for these services, it must be tempting to dip in?*
Page-Hanify: Being a service provider and being an equipment supplier are very different businesses.

AC: *What is the major difference?*
Page-Hanify: Our culture. Boeing does not run any airlines and, thank heavens, none of the airlines run Boeing!

AC: *If OTC and TCNZ had exercised their options in Alcatel TCC, they would now have a stake in submarine cable manufacturing.*
Page-Hanify: Yes. Cross-shareholdings do make sense.

AC: *If Telstra were privatised, would Alcatel Australia consider taking a share?*
Page-Hanify: This issue came up recently when they were talking about privatising France Telecom. There was some discussion in the press as to whether Alcatel would or would not be a shareholder. It's the same hypothetical situation.

AC: *Alcatel Australia signed a Partnership for Development Program [PDP] agreement in February just before the elections. What does that involve?*
Page-Hanify: We nominate percentages of R&D and percentages of export against expected sales levels. They're the main things.

AC: *As a major manufacturer and supplier of customer premises equipment, including PABXs and residential phones for Telstra, Alcatel has also been subject to the IDA [Industry Development Arrangements]. Is that correct?*
Page-Hanify: Yes. We have Commander key systems, PABXs, residential phones and new advanced services phones which involve caller identification, centrex and so on.

AC: *As a member of the PDP, did you apply for an exemption from the IDA scheme?*
Page-Hanify: No. We agree with the IDAs and we meet them with no trouble.

AC: *Did some of your competitors apply for an exemption?*
Page-Hanify: I think that three or four have, though I'm not sure if it's rumour or fact.

AC: *If all the big companies in the PDP or those with Fixed Term Arrangements applied for IDA exemptions, wouldn't this have a major impact on manufacturing?*
Page-Hanify: Yes. It could have an impact. But we happen to believe the IDAs have been very successful. That is clearly shown by the Australian content and the export numbers.

AC: *What are your major exports?*
Page-Hanify: System 12, submarine systems, transmission systems and CPE. We also manufacture the QPSX design, a really state-of-the-art leading edge broadband system, for QCL in Western Australia. We have exported that to about 13 countries. The numbers for that are not enormous yet, but the coverage is exceptionally good and the prospects are very bright.

AC: *What are Alcatel Australia's overall export figures?*
Page-Hanify: This year they will be about 33% of sales or well over $200 million.

AC: *And what proportion of all telecoms exports does Alcatel Australia contribute?*
Page-Hanify: That figure amounts to something like half the total industry exports.

> *"All the analyses from overseas where there is a dominant telco and competing carriers show that by far the largest part of the capital purchase business remains with the national carrier. So there's business sense in our decision to focus on Telstra."*

AC: *Again, if you lose the supply contracts with Telstra, surely that will put a dint in the figures?*
Page-Hanify: Absolutely. There's no question of that.

AC: *I understand TIDA [Telecommunications Industry Development Authority] has intervened by asking suppliers to spell out the impact of losing the Telstra business.*
Page-Hanify: They sent a letter asking us to give our views on the industry structure, the structure of our own companies and, if we wished, any views we might have on how sourcing arrangements could affect that. You call that an 'intervention' but, of course, that was TIDA doing its job.

AC: *It would seem to be the first significant thing TIDA has done.*
Page-Hanify: TIDA has been, in my perception, gaining an understanding of the industry and the industry players. It's not yet at the end of its first year.

AC: *That sounds like you're a supporter of TIDA though it has plenty of critics, including some within Telstra. Presumably these supply contracts are a matter for Telstra to decide rather than for the Government through TIDA?*
Page-Hanify: I'm not convinced that Telstra saw this as TIDA exceeding its authority.

AC: *There seem to be a number of groups looking at exports including AEEMA [Australian Electrical and Electronic Manufacturers' Association] and the Export Marketing Task Force. Do they overlap?*
Page-Hanify: No. The Task Force includes the Government and the carriers. The AEEMA group nominates members to the Task Force, which is important because the cooperation of carriers, suppliers and Government is a sensible way of getting telecommunications exports in a country like Australia.

AC: *Did you try for any supply contracts with Optus?*
Page-Hanify: No.

AC: *Why not?*
Page-Hanify: We made a strategic decision that the sensible course was to focus our efforts on Telstra.

AC: *How do you expect Telstra's loss of market share to impact on its suppliers?*
Page-Hanify: All the analyses from overseas where there is a dominant telco and competing carriers show that by far the largest part of the capital purchase business remains with the national carrier. So there's business sense in our decision to focus on Telstra.

AC: *Yet recent press reports have suggested that Telstra is cutting back its network spending.*
Page-Hanify: There's a fairly well-defined pattern now of what happens with competition. Prior to competition, the existing telephone company increases its capital spending and its modernisation. With competition, there is a continuation at the higher level because the new competitor has to ramp up quickly. Then the spending falls below the trend line again after a year or two. In other words, they buy a lot in advance, and once competition hits, they tend to fall off. This was the case in America, the UK, New Zealand and so on.

AC: *When do you expect this reduction to occur here?*
Page-Hanify: Well, you've just mentioned press reports. It's probably about the right time. The interesting thing is that the peak spending tends to balance out the fall, and you get back to the original trend line, which probably proves there is some immutable law of nature at work here that we don't understand! Another thing that happens, of course, is that volumes go up, but our prices

are under pressure all the time.

AC: *So this means things get tougher for the suppliers?*
Page-Hanify: Yes. But just because it gets tougher doesn't mean you say 'That's all too hard' and walk away. You get better!

AC: *How do you view Australia's future, both in terms of telecoms and the economy generally?*
Page-Hanify: In telecommunications, I think it's brilliant. For the economy as a whole, I'm an optimist. I think that we will surprise ourselves in retrospect at how well we've got our act together in the last few years.

AC: *Why is the telecoms future so brilliant?*
Page-Hanify: We've got lots of things going for us. Our position in this part of the world is great. We've got a very good engineering workforce. In terms of skill, they're as good as anywhere in the world. We have a big advantage in that we're not afraid to use other people's ideas — that is, we haven't got the 'Not Invented Here' factor so prevalent in older societies.

And the trends in manufacturing favour us because they've moved from the mass production of a decade or two ago to a combination of hardware and software manufacture. With each exchange, we deliver an entire software program, so we're manufacturing software and hardware. This involves an enormous team effort, and Australians are very good team players. That will be good for the Export Task Force. On top of all that, our starting point is a telecommunications network that is very modern.

AC: *Are there any disadvantages in being a French company?*
Page-Hanify: We don't see ourselves as a French company. If you look at our parent company, Alcatel Alsthom, about 20-25% of the shareholders are in the US and UK and it is quoted on nine or ten stock exchanges. In fact, even though our headquarters is Paris, our business language is English. That doesn't sound much like a French company, does it?

AC: *So how do you refer to Alcatel? As a multi-national company?*
Page-Hanify: A multi-domestic company. That's why we have Australians running an Australian company and Germans running a German company. For Alcatel, Australia is a domestic market — one of many.

AC: *Alcatel Alsthom recently had a $500 million commercial paper issue for its Australian subsidiaries, Alcatel Australia and GEC Alsthom. Why not have a share float?*
Page-Hanify: We tend generally to have 100% owned subsidiaries. But none of those things are fixed for ever. Our company in China, for example, is a joint venture.

AC: *Why the need for $500 million?*
Page-Hanify: It takes over other debt arrangements that we have. Alcatel TCC is still carrying about $60 million debt, which is not unusual for a submarine cable factory. And it gives us, in the parlance of the financial markets, 'headroom' to expand if opportunities arise.

AC: *What would you see as your major success during your time at Alcatel?*
Page-Hanify: In my period, there are probably two major successes and I'm not taking credit for these myself, though I was lucky to be at the helm. The first is our entry to the undersea cable business, a brand new business for Australia, and the creation of a fifth undersea cable systems supplier in the world market. The second is the System 12 switch which has arrived just at the right time to match Australia's aspirations and our own.

Liz Fell is a freelance journalist based in Paddington (NSW).

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Tom Amos

Dominance or Survival?

In a Darwinian like-action Telecom recently declared it did not like Austel's views that it was still the dominant player in mobile communications and headed off to the courts to try and have the view overturned. The litigants from Lonsdale have been having a tough run lately, what with ballots, SPAs and discount wars breaking out, which must be pushing the speed of internal reform and resizing at a break-neck speed. The impact for the user is positive in that the bills for service are dropping with the averaging-down of prices. But Telecom is caught in a dilemma of being dominant. As dominant carrier, it is not allowed by legislation to discount BCS services, and as everyone knows, it once considered everything basic. Did they get it wrong or are they trying to draw the lines for a real discount battle yet to come?

After over 90 years of monopoly service provision and just one year of competition, Telecom has decided it is now no longer a dominant force in one BCS sector of the new telecommunications business, mobile communications. This is an amazing but understandable marketing department claim, given that since competition commenced almost 20% of the total business has migrated to the new entrant. Bleeding on a grand scale with about half of all new connections going to each carrier or just proper market action?

The two BCS carriers have been selling and reselling the same Telecom commodity, stimulating the market growth and bumping the total marketplace to in excess of three quarters of a million users just on this one analogue service. And to think that Telecom originally introduced the service as a premium one, believing it would be only used by politicians, yuppies and high fliers. How wrong could you be!

Today the service growth is still very high compared to other communication services, and all of the services are provided on the Telecom analogue AMPS network, whether they are sold by Telecom or not. The *Telecommunications Act, 1991* is very clear in its intent to allow the non-dominant carrier to discount services, whilst the dominant one must offer any reduced prices to everyone if it wishes to compete on price with the new entrant. This supposedly was to ensure that the dominant carrier would not offer selective discounts below cost in order to prevent the new entrant from gaining significant market share. At the time there was significant consultation with the Trade Practices legislation and careful study of what had occurred in overseas markets, particularly the US, so the mistakes of others were not repeated in Australia. Simply, there was no way that either a regulator or even the Government could monitor market activity, and, in particular, the exploitation of vertical niche services like mobile to prevent others being successful.

But what is the definition of dominant? Clearly the common usage and the understanding of the term in a business sense are now very much at odds, as Telecom is claiming that Optus' 20% network user share, as a reseller of the 100% Telecom-owned network, makes Telecom no longer dominant in the marketplace and thus no longer subject to the restrictions imposed by the Act. Heady stuff to say the least, and exactly the action that was foreshadowed when the Act was written, based upon the US experience.

Telecom asked Austel to rule on its claim it was no longer dominant, and some months went by as Austel implemented a two-part process of considering the question and any relevant parallels, such as the Queensland Wire case. Austel then issued a draft set of reference parameters for industry comment prior to making a final report which ruled that Telecom was indeed dominant, as it had greater market power. This was based on the fact that it actually owns all of the AMPS system that both carriers use, and sets the price and conditions (for instance, the fact that you cannot dial '1' from a mobile!). The impact of the new GSM system was considered not to matter at this time, as there were no significant customers.

Why it took so many months to make a decision that you could have made over the telephone only Austel knows, but the decision was definitely well-reasoned and widely sourced.

Telecom did not agree, and has now moved into the courts to try and overturn both Austel's deliberations, and by extrapolation, the intent of the original Act. Shades of the US environment are starting to darken the once bright Australian deregulatory model. Maybe it's a Flexi-Plan/SPA reprisal ploy — which, incidentally, was also considered to be supportable under the Act when it was drafted, but was not challenged by the new operator when reviewed a year or so back. Oh, how views change!

Regardless of the technical interpretation and careers that hang on Telecom being non-dominant, the simple fact is that they are the biggest. You would have trouble convincing almost anyone that even though you own, operate and control all of something, one of your sales outlets actually sets the agenda for your whole business. I will be keen to see how you can actually mount such a case and keep a straight face when you are asked who gets the money!

We would all like lower prices for services, but they need to be cost related and sustainable. Telecom could simply lower the price of mobile use to everyone, rather than target discounts in order to appear to be saving users money. Maybe I am getting tariff information overload, but I have great difficulty understanding the plethora of mobile tariff options that have been carefully crafted for me to make cheap calls. Whatever happened to sliding usage discounts that were understandable and automatic?

The introduction of competition into the telecommunications market has meant that we implicitly embrace the course of natural selection and survival of the fittest. The fact that Telecom is now seeking court relief simply serves to underline the erroneous arguments put forward only a short time ago, that is, that Telecom was a natural monopoly and represented the most efficient method of delivering telecommunication service to Australia. Let's hope we are not on a Compass course.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

Dr Terry Cutler

After the Ballot: A Lose-Lose Scenario

Everything about the current ballot for the preselection of your preferred carrier seems rather bizarre, and not least the fact that many industry commentators seem as confused as most of the public.

The King Canutes of the industry, who now talk bravely about 'quashing' the ballot, were nowhere to be seen or heard last year when some intelligent analysis might have been more than helpful.

For good or ill, the ballot is happening. As in the Pay TV debacle, the industry policy eggs can't be unscrambled. But there are one or two lessons we might learn from this process, and we need to start posing a few questions about the consequences of the ballot.

First, a few lessons. The decision-making processes, from what one can deduce from the outside, seem to make the MDS affair look straightforward. Implementing competition policy in telecommunications has involved quite a number of pretty important political trade-offs, not least the question of the straight transfer of balance sheet value out of Telecom versus calls for greater efforts in an increasingly competitive regional market. Something like the ballot is the ultimate form of regulatory intervention in market operations, but it was largely set up behind the scenes by administrative manoeuvring, with virtually no scrutiny or accountability. Curiously, it has been left to overseas journals to report on a process involving the distribution of unsigned 'draft' letters, and when something more formal is called for, a hasty dash to promulgate successive letters of policy 'interpretation.'

In my view, Austel has been the hapless victim of the whole process. Charged with implementing a policy process in which it has little say, and left to go centre stage in 'selling' the ballot package thrashed out between the carriers (with a little bureaucratic help when needed), Austel has borne the brunt of everyone's frustration. At a time when the Government is looking at the administration of competition policy through Professor Fred Hilmer's review for Treasury, a good case study would be the relative roles of Canberra, Austel, and the carriers in the shaping of the ballot.

For the business management case file, the ballot has put amazing new demands on corporate management. Little in corporate experience could prepare the senior executives of Telecom or Optus for this type of electoral campaigning for market share. This rewrites the rules of marketing in terms of pure political campaigning, even down to presidential-style debates and voter-wooing promises and sweeteners. This has made even the toughest takeover battle look tame.

What happens next? By the time this article appears there will be growing media speculation about the progressive results of this drawn-out battle. The true picture will be hard to work out, as everyone will have an interest in slanting the initial scores to their own advantage. The release of information is likely to be highly selective, and geared to support short-term marketing campaigns. We will all end up comparing apples and oranges. Response rates, customer numbers versus customer lines, number of lines versus revenue share, and so on. The crucial data at any point in time is revenue share. The customer and revenue matrix is highly skewed to a small proportion of high value customers. That is something the carriers will always want to keep to themselves.

Optus needs a good result, but not too good. Optus has little downside from an average showing; any result is likely to be well above what was in the original business plan on which they put their money. Too good a result invites a swing back of the regulatory pendulum through a levelling of the 'playing field.' At stake is the highly favourable interconnect regime, and the dominance tests imposed on Telstra. A mediocre result would, however, be a PR set-back, and make it harder for Optus' Australian investors to work out the optimal time to list their stock.

What would pose a real dilemma for Optus is a consistently low response rate. A second-round ballot is an option Optus almost cannot afford to take up. As it is, the drawn out timetable for this rolling poll introduces the risk of campaign and voter fatigue. It is interesting to speculate about the possible vagaries in the public's reaction to any re-run, and whether re-runs would support, or fatally undermine, the job of converting people's ballot pledge into long-term carrier loyalty.

Whatever the outcome, Telecom is likely to have trouble on the industrial side. Too good a result, and Telecom will come under pressure to ease the pace of downsizing. Here the confusion between customer numbers and actual revenue shares will work against Telecom. A bad result, and Telecom will have no option but to accelerate its business restructuring.

A bad result for Telecom is one that fundamentally changes the market share profiles on which its present capital structure is premised, and invites further credit rating downgrading.

Whatever the result, the aftermath of the preselection ballot will change the opportunities for price competition. The issue here is whether the ballot's 'lock in' of customers increases or decreases the prospects of greater route-based pricing and the de-averaging of standard service tariffs on Telecom's part. From the consumer perspective, it would be a good outcome if both carriers shift from the mass promotion of 'price specials' to the targeted marketing of service packages.

The key issues after the ballot will be how we think about market dominance, and start to shape up for the approach of 1997. On both fronts the danger is that a drawn out obsession with ballot results will reinforce a focus on actual market shares as the measure of industry competitiveness, rather than the test of contestability. The irony is that continued policy intervention to produce particular market share outcomes might well reduce contestability, and simply entrench an oligopolistic industry structure. Many users could simply end up with the 'virtual monopoly' of their choice.

Dr Terry Cutler is Managing Director of Cutler Consulting, and is based in Melbourne.

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Kevin Tolly and
David Newman

Evaluating Port-Switching Hubs

The concept of virtual workgroups is taking off, and this new class of networking technology is expected to be the preferred way of implementing these virtual get-togethers.

With hostile takeovers, corporate reorganisations, and just-in-time manufacturing on their minds, the last thing corporate movers and shakers want to talk about is technology. But when they get behind the boardroom door, the first thing they want to hear is that all the resources of the organisation — networks included — are poised to help them put their plans into action. That means career-minded net managers best be prepared to get data instantly to whomever needs it or reconfigure LANs on the fly to let employees at different locations collaborate.

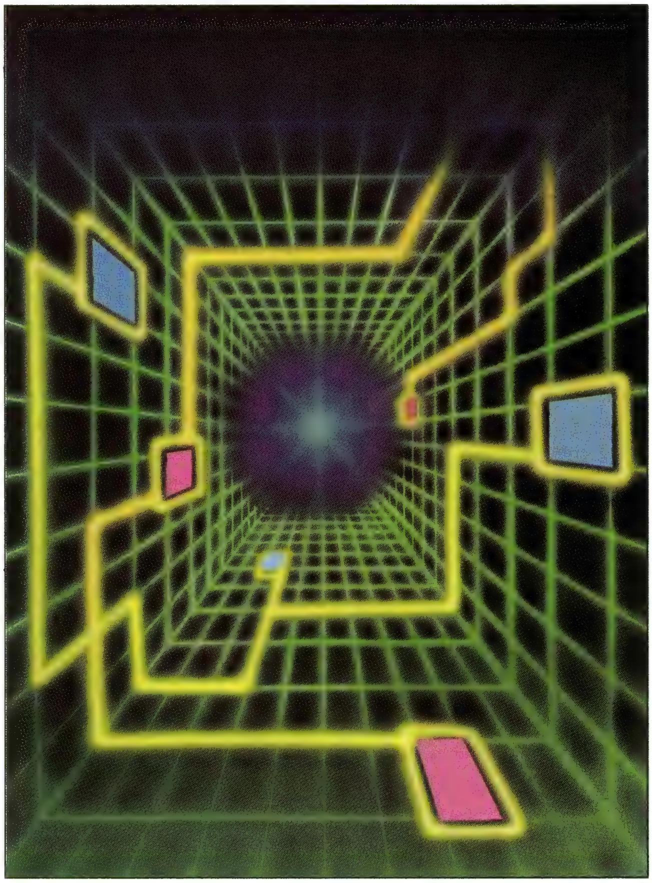
Corporations, of course, are rarely that fluid. But virtual workgroups, which allow employees to team up without regard to physical location, are well on the way to reality. And a relatively new class of products known as port-switching hubs looks to be the preferred way to implement these virtual get-togethers.

Conventional hubs require that members of a workgroup (technically speaking, those users attached to the same LAN segment) be located close to one another — in the same department, say, or in adjoining cubicles. And with standard-issue hubs, the only way to move a user from one segment to another is by manually unplugging the user's computer from one port on the hub and moving it to another (which means a trip to the wiring closet).

Port-switching hubs, in contrast, make it possible for any users to share the same segment, regardless of their location. That means they gain full-speed access to all resources on the segment. What's more, port switching allows net managers to reconfigure segments and move users from a central console, often simply by pointing and clicking with a mouse.

It's easy to see why network managers are enthusiastic about port-switching hubs. But the sceptics at the Data Comm Test Lab wanted to see if this type of networking gear really deserves its reputation. To find out, the Lab took a look at four port-switching hubs: Bytex's Model 7760 Intelligent Switching Hub, Chipcom's Online System Concentrator, Lannet Data Communications' Multinet II LET-36, and Xyplex's Network 9000 Intra-networking Hub (see Table 1 on page 68). At this point, these are the only vendors in the market. This may be as much of a surprise to *Australian Communications* readers as it was to Lab personnel, since the term 'switching hub' is used by many vendors to describe their offerings (including Kalpana, Synernetics, and 3Com, to name just a few).

But it turns out that most switching-hub vendors are talking about high speed gear that switches stations among segments, thus delivering faster connectivity than conventional bridges and routers. These products will be the focus of a future Lab test.



The Lab found much to praise in the products it evaluated. Besides enabling virtual workgroups, port-switching hubs tighten security by allowing filters to be set up that check every port to ensure that users are authorised to access the network. Port-switching hubs also provide high levels of fault tolerance, thanks to redundant power supplies and hot-swap capabilities.

One product in particular stands out — the Model 7760 from Bytex. The Bytex box supports up to 152 backplane segments. But

Table 1: Selected Vendors of Port-Switching Hubs

VENDOR	PRODUCT	PORT CARDS	MAXIMUM BACKPLANE SEGMENTS	INTERNETWORKING MODULES	ROUTED PROTOCOLS
Bytex JNA Network Services (02) 417 6177	Model 7760 Intelligent Switching Hub	Ethernet[1], Token Ring	3 Ethernet or 152 Token Ring	4-port Token Ring bridge/router	IP, IPX, AppleTalk DECnet, OSI, Vines XNS
Chipcom (02) 416 0653	Online System Concentrator	Ethernet, FDDI[1], Token Ring[1]	3 Ethernet or 4 FDDI, and 7 Token Ring[2]	2-port Ethernet bridge, 2-port Ethernet bridge/router	IP, IPX, AppleTalk, DECnet, OSI, Vines XNS
Lannet Data Communications† Ipex (03) 242 5000 Dataplex (03) 210 3333	Multinet II LET-36	Ethernet, FDDI[1], LocalTalk[1], Token Ring[1]	4 Ethernet, 1 FDDI, and 2 Token Ring	2-port Ethernet bridge, 2-port Token Ring bridge, terminal server for LAT and TCP/IP Hosts	Not applicable
Xyplex NetArch (07) 393 1933	Network 9000 Intra-Networking Hub	Ethernet, FDDI[1], Token Ring[1]	3 Ethernet, 1 FDDI and 4 Token Ring	4-port bridge/router, Terminal Server for LAT and TCP/IP hosts	IP, IPX, AppleTalk, DECnet

1. Does not support port switching
2. Maximum simultaneous number of segments is 1 Ethernet, 1 FDDI and 3 Token Ring

† Note that all Lannet prices quoted in this article were arrived at by taking the highest figure supplied by Ipex and Dataplex. Consequently, a complete system from either vendor will be *less* expensive than shown here

IPX = Internet Packet Exchange
UTP = Unshielded Twisted Pair
XNS = Xerox Network Services

it's not just the numbers that are in Bytex's favour. Its product was designed from the ground up as a switching device — hardly surprising since the company is a leading supplier of matrix switches. Bytex thus earns a Tester's Choice award, the only one given for this round of evaluations.

The other products also exhibited a number of strengths, but overall were too close to single one out for an award. The Lab was impressed by the ease of configuration of the Online System from Chipcom; the range of front-panel indicators on the LET-36 from Lannet; and the extensive control over individual port attributes allowed by the Network 9000 from Xyplex.

For all of their promise, though, port-switching hubs raise some important questions when it comes to scalability. Basically, the more logical workgroups (segments) network managers create, the more bridges (and in some cases routers) they'll need to connect them. And when traffic crosses bridges and routers it slows down. True, conventional hubs also require segments to be joined by bridges and routers, but the big selling point behind port-switching hubs is that they allow segments to be established as needed (indeed, they encourage segmentation). It's ironic, then, that network managers who exploit this ability to its fullest end up being penalised for their enthusiasm.

The Lab also thinks it necessary to address the importance of port switching in a hub's overall feature set. No doubt about it, port switching is an attractive option. But in itself it's not a reason to buy a hub. Port-switching hubs, like their conventional kin, must be evaluated in terms of chassis size, add-in modules, and network management.

Net managers looking at port-switching hubs should be forewarned that today's products can't perform port switching on both Ethernet and Token Ring. Three of the hubs switch ports on Ethernet segments; the Bytex Model 7760 switches ports on Token Ring segments. All the vendors sell modules for other network topologies, but without port-switching capability. Since most corporate networks consist of multiple LAN types, the port-switching shortfall is a serious drawback. The vendors say they are working to correct the problem.

The preponderance of Ethernet hubs isn't surprising. Ethernet's relatively simple broadcast scheme is far better suited to port switching than Token Ring's scheme, which uses a more complex approach to network communications.

In its evaluation, the Lab examined the hubs' basic port-switching capabilities and more advanced features like fault tolerance, security, and scalability. The Lab also asked each vendor to spec out a network that used port-switching hubs to link virtual workgroups. Finally, the Lab compared same-segment throughput with that achieved when traffic is bridged between segments. This twofold tack made it possible to gauge the performance penalty exacted by these intermediaries.

Port-Switching Architecture

Simply defined, a port-switching hub is a chassis equipped with multiple high speed backplane segments (see Figure 1 on page 69). The backplanes accept multiple port cards, each of which typically connects 8-12 nodes. It also accepts other modules, like power supplies, internal bridges and routers, and network management units.

Backplanes are the key components of port-switching hubs. LAN segments can reside on the backplanes, making it possible to create segments that span multiple port cards — the basis of virtual workgroups. Like their conventional counterparts, port-switching hubs also allow segments to reside on individual cards.

A key advantage to having segments residing on the backplane (besides port switching itself) is that it can cut down on the number of port cards that need to be purchased. A company with three departments of seven users each, for example, typically would buy three-port cards (one per segment).

If the company was using 12-port cards (a common configuration), five of the ports on each would go unused. By utilising a port-switching hub, the company can purchase two 12-port cards, assign segments across both, and still have three free ports.

Finding Faults

As mentioned, port-switching hubs are highly fault-tolerant. The vendors' emphasis on fault tolerance is hardly surprising, since one of the essential benefits of port-switching hubs is the ability to ensure maximum uptime in the face of frequent changes to network structure. All four vendors offer dual power supplies, and all can use redundant power sources.

PRICE (EX TAX)
Chassis and 2 power supplies $10,787; 12-port UTP Token Ring card $2,692; 12-port 10Base-T Ethernet card $3,953; 2-port Token Ring router P.O.A.; Token Ring Management Module P.O.A.
Chassis and 2 power supplies $11,254; 6-slot concentrator $4,834; fibre transceiver $1,274; 12-port UTP Ethernet card $4,116; multiport bridge/router $18,923; Ethernet management module $6,054
Chassis and 2 power supplies $8,084; 10-port UTP Token Ring card $1,785; 12-port 10Base-T card $3,215; Ethernet bridge $5,859; Token Ring bridge $8,145; 16-port terminal server $7,285; Ethernet/Token Ring SNMP modules $6,000 each
Chassis and 2 power supplies $6,408; 12-port 10Base-T card $4,085; 12-port FOIRL card $7,074; Ethernet bridge/router processor and I/O modules $14,149; Ethernet management module $2,533

FOIRL = Fibre Optic Interrepeater Link
LAT = Local Area Transport

All the hubs continued to operate if port cards or network management modules were removed, and all recovered when a port card was pulled from one slot and reinserted in another.

The hubs also spotted physical-layer problems with faulty end-stations and took corrective action. Bytex's hub found beaconing stations on Token Rings and isolated them. Using a feature called Beacon Guard, the Bytex hub also was able to prevent stations from entering a Token Ring at the wrong speed.

In response to end-station problems on Ethernet LANs like jabber or excessive collisions, the Chipcom, Lannet, and Xyplex hubs issued network management alerts and removed faulty end-stations from the network. Xyplex's network management software allows thresholds to be defined for error conditions and shuts down ports when attached nodes exceed those thresholds.

Despite such strengths, though, the Lab spotted minor design problems that could affect fault tolerance in two of the hubs. The power switch on the Xyplex product is a flat button on the unit's front panel, which makes it easy to press accidentally. On the Lannet box, the power cord plugs into the front panel and is too easy to accidentally disconnect.

How Safe is Safe?

LANs, by their nature, are low-security environments. On both Ethernets and Token Rings, all the data from every station passes through all other stations. Port-switching hubs might seem to increase security risks, since they open up more possible points of entry, but vendors have taken some steps to control network access.

All hubs offer per-port traffic filters, typically based on MAC addresses, to help deter unauthorised users from sending or receiving data. Xyplex's network management software was particularly robust in this regard, allowing different filters to be assigned to as many as 1,024 individual ports.

Filters are particularly useful in guarding against unauthorised use of end-stations' software addresses, which are relatively easy to obtain with a LAN analyser. But end-stations also have hardware addresses hard-coded into their adaptor cards' firmware. With address filtering, net managers can use the hardware address to verify that traffic with a particular software address actually originated at the proper end-station.

Scaling Failings

To some network managers, the designation 'port-switching hub' implies that these devices can dynamically reassign ports in response to traffic patterns. They can't. Port-switching hubs only reassign traffic in response to operator intervention.

What's more, port-switching hubs don't increase bandwidth on a given LAN segment beyond the limits of the LAN topology; the most they can do is allocate more segments, with fewer users on each (see 'The ATM Alternative' on page 75). Once a segment has all the traffic it can handle, bridging becomes necessary.

The number of bridges needed depends on how many backplane segments the hub offers. Bytex is way ahead of the pack, with up to 152 switchable segments. Chipcom and Lannet support four Ethernet segments on the backplane, and Xyplex supports three. Vendors of Ethernet hubs also support Token Ring, FDDI, and AppleTalk segments, but these cannot be port-switched.

Net managers might be delighted by a hub's ability to handle well over 100 segments, but the prospect of buying bridges to link each segment is likely to provoke a very different response.

They also may be troubled by the fact that port-switching hubs generally use bridges — rather than routers — when connecting segments. That's because hubs have no way of handling a key element of routing — station addressing. By setting up firewalls between segments, routers can prevent certain types of traffic from being passed onto the network and can help eliminate broadcast storms. Bridges simply forward all the traffic they receive, and thus offer no such assistance.

Lost in the Mail

Why can't routers be used? In IP networks each end-station has a unique address that identifies both the station and the IP subnetwork it's assigned to. These addresses are handled by routers at the network layer (Layer 3) of the OSI communications stack. However, hubs are involved only at the physical layer (Layer 1) of the OSI stack, and thus never see Layer 3 addresses.

Port-switching hubs can wreak havoc with IP addressing. A port-switching hub can move a port from one logical segment to another with the click of a mouse, but the relocated end-station still attempts to communicate using its old IP address. That puts the station in conflict with the map of the IP subnetwork stored in the router, which means communication is impossible until the network manager or end-user manually updates the IP address.

Figure 1: Backplane Basics

Multiple backplanes are the key components of port-switching hubs. Because LAN segments can reside on the backplanes, it's possible for them to span more than one port card. Segments also can span a number of hubs.

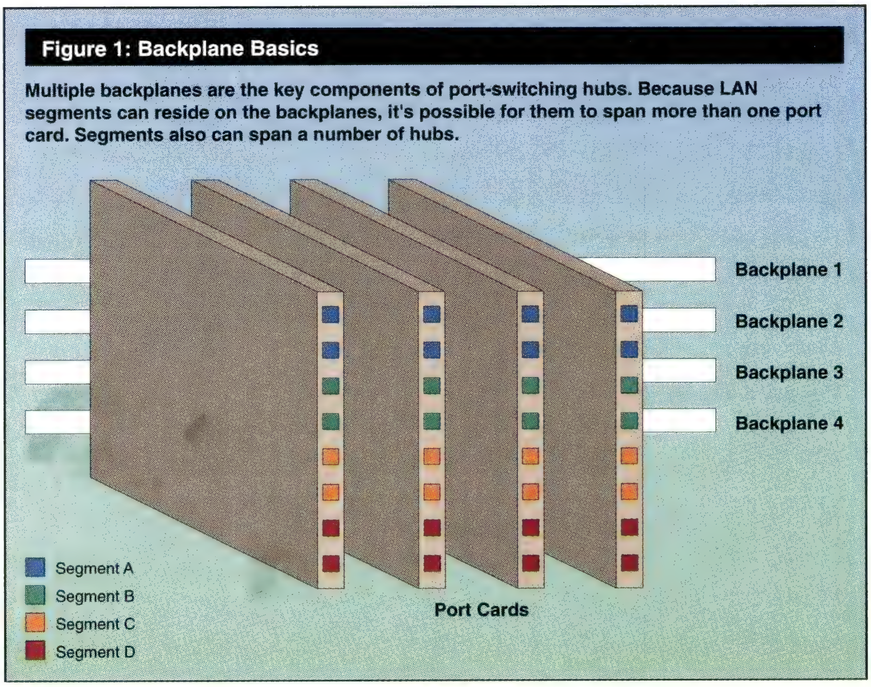
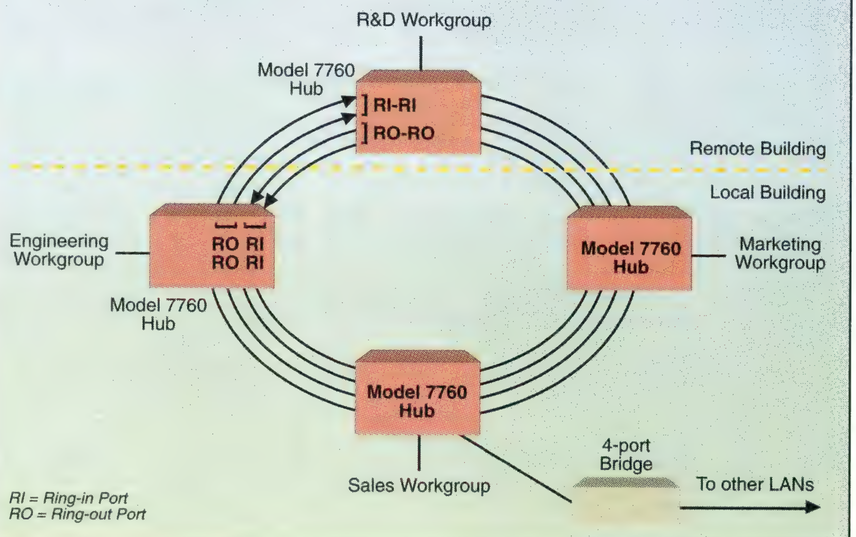


Figure 2: Bytex's Giant Token Rings

In its fully redundant four-segment configuration, Bytex specified four giant Token Rings across a corporate campus. Ring-in and ring-out ports in each hub are linked to adjacent hubs.



Thus, port-switching hubs require that bridges be used for all communications across subnetworks or domains. Of course, routers still can connect networks outside the port-switching hub's domain, because port assignments on those networks can't be altered by a port-switching hub.

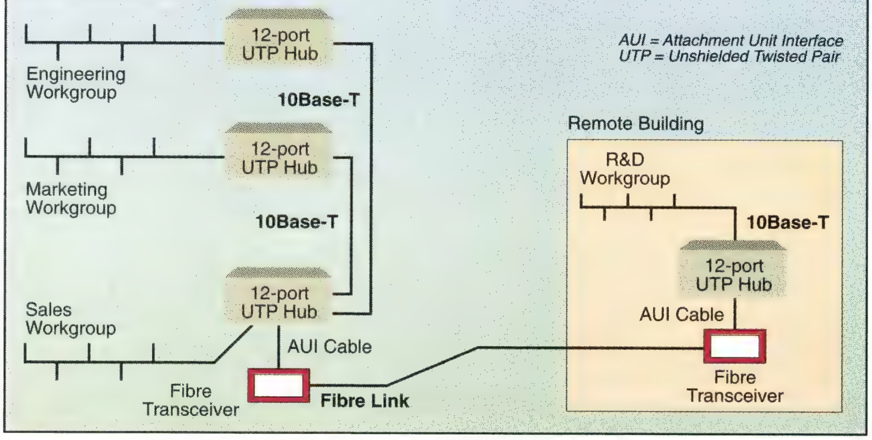
A Switching RFP

To gauge how port-switching hubs might be deployed, the Lab sent each vendor an RFP (request for proposal) for a network with multiple segments at multiple locations. The RFP asked vendors to design a network that met the following requirements:

- Four hubs are needed at four physical locations. Three are in one building, and a fourth is in another building across campus. This requirement was specified to determine whether or not segments could span distances without bridges or routers.
- Four workgroups need to use the hubs — sales, engineering, R&D, and marketing. Each workgroup consists of 12 members at one physical site. This criterion tested the hubs' port-switching capabilities.
- All employees occasionally need to communicate with all other employees. This requirement tested the hubs' ability to scale in multi-segment environments.
- WAN access is needed, preferably via a central router. This forces all segments to be connected and determines how efficiently connections to any one port can be made.
- Central management is available for all workgroups. This requirement examined the number of network management modules needed, another measure of scalability.

Figure 3: Chipcom's Collapsed Backbone

Chipcom specified a collapsed backbone to link four workgroups. The hubs within the same building are connected with 10Base-T wiring, while the remote link uses fibre optic cabling and transceivers.



All the vendors were able to meet most requirements of the RFP. Responses varied widely. Scalability didn't turn out to be as big a concern as the Lab thought it would be, partly because only four segments were specified. A higher number of segments may have revealed the weaknesses of port switching in large networks; but then again, more segments might have shown the true strengths of port-switching hubs, particularly the Bytex box.

Bytex

Bytex offered two configurations, one fully redundant and the other non-redundant. The former is essentially four giant Token Rings connecting four Model 7760 hubs across a corporate campus (see Figure 2). Each hub is linked by ring-in/ring-out modules. Copper connections are used between the hubs in the same building; fibre connects the hub across campus.

With all components — four hubs, four controller modules, eight ring-in/ring-out modules, 17 12-port UTP modules, a four-port Token Ring bridge, and network management software — the cost of this configuration is $120,761.

Bytex's non-redundant approach is built around a collapsed backbone. One of the three hubs located in the same building acts as a 'hub of hubs,' eliminating two ring-in/ring-out modules. The hubs in this configuration have single power supplies, which yield a $2,700 saving on each hub. The overall cost of this configuration is $105,468. In both cases, Bytex designated a four-port external bridge from Crosscomm to establish links to other LANs.

Chipcom

Chipcom specified a collapsed backbone to link the four workgroups (see Figure 3). The hubs within the same building are connected with 10Base-T wiring, while the remote link uses fibre optic cabling and transceivers.

The transceiver in the central building attaches to the hub via an eight-port AUI (attachment unit interface) module in the central hub. The central hub also holds a six- slot concentrator, a 12-port UTP port card, and all four use dual power supplies. The total cost of Chipcom's design, including all hardware and a copy of a $4,116 network management package, is $98,000.

Lannet Data Communications

Lannet's configuration can work in either a collapsed backbone or distributed design (see Figure 4 on page 72). Lannet was the only Ethernet vendor to specify main and redundant links to all sites, adding an extra measure of fault tolerance. Net management modules in each hub also boost net reliability by checking network signalling.

Lannet took two steps to contain costs. First, it specified five-slot hub chassis at all

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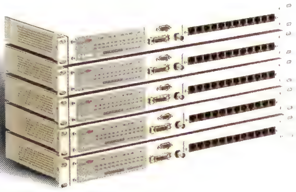

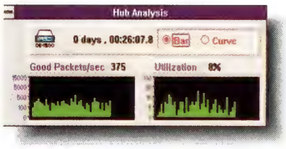

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Table 2: Bridging Performance Penalties

	64-byte frames			1,024-byte frames			4,096-byte frames		
	Same segment throughput (Kbps)	Bridged throughput (Kbps)	Percentage change	Same segment throughput (Kbps)	Bridged throughput (kbps)	Percentage change	Same segment throughput (Kbps)	Bridged throughput (Kbps)	Percentage change
ETHERNET HUBS									
Chipcom	42.19	17.57	-58.36%	284.01	129.04	-54.56%	N.A.	N.A.	N.A.
Lannet	41.98	31.54	-24.87%	286.95	198.12	-30.96%	N.A.	N.A.	N.A.
Xyplex	41.74	34.04	-18.45%	286.46	208.84	-27.10%	N.A.	N.A.	N.A.
TOKEN RING HUBS									
Bytex	22.54	19.18	-14.91%	240.64	198.41	-17.55%	549.25	411.00	-25.17%

1. Bytex hub tested with external bridge from Olicom

N.A. = Not applicable

locations, which cost less than the vendor's 18-slot versions. Second, it designated UTP on all links, including the one across campus. The total cost of Lannet's design, including four hubs, four network management modules, four controllers, and network management station and software, is up to $82,000, although prices will vary between distributors.

Xyplex

Xyplex's approach differed radically from the other vendors'. It assigned segments to each workgroup at all four locations and put the most equipment in the remote building, which housed a single hub (see Figure 5 on page 75).

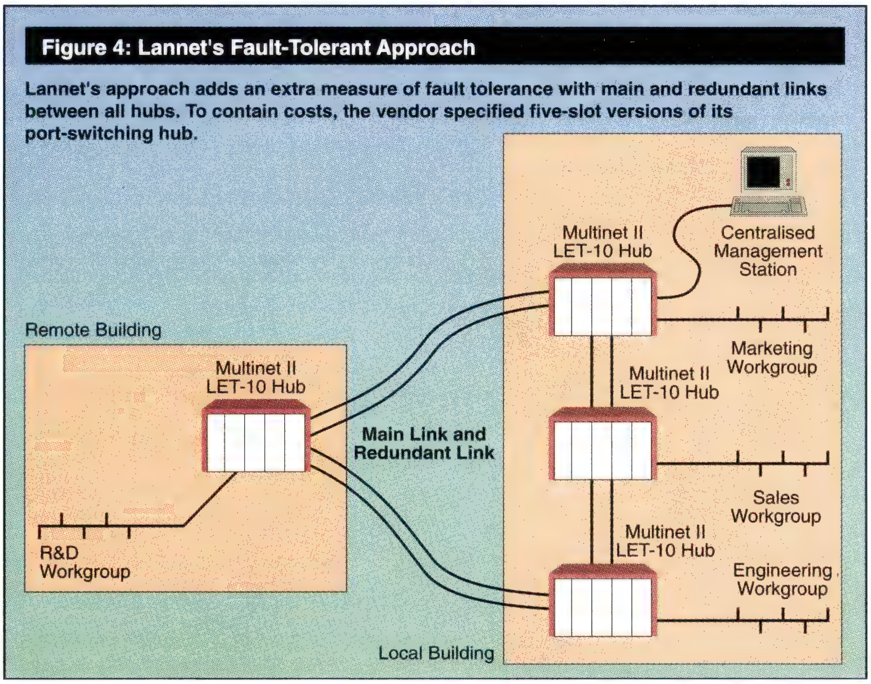
The vendor's hubs support a maximum of three Ethernet segments, but a fourth segment can be added through an AUI connection to an FOIRL (fibre optic interrepeater link) port card on the remote hub. Notably, the fourth segment does not connect to the backplane of any hub. In essence, Xyplex's approach creates an external segment for all the hubs.

All the segments communicate through the vendor's four-port bridge/router module, also located at the remote site. Nevertheless, because all four ports of the bridge/router module are used by LAN segments, Xyplex's configuration fails to address one requirement of the RFP: WAN connectivity. The vendor's hub chassis does have room for an additional bridge/router module — at a cost of $5,048.

The local and remote buildings communicate via a fibre optic link. Xyplex specifies the use of 12-port 10Base-T port cards on all four hubs. The remote hub contains dual power supplies; the three other hubs have single power supplies.

Figure 4: Lannet's Fault-Tolerant Approach

Lannet's approach adds an extra measure of fault tolerance with main and redundant links between all hubs. To contain costs, the vendor specified five-slot versions of its port-switching hub.



Xyplex's solution adds up to $92,550. The vendor's component list includes four hubs, three controllers, one 4-port bridge/router module, seven 10Base-T port cards, a five-hub net management module, five network management modules, and a network management software licence.

The Test Bed

The Lab gave performance a good going-over — although this aspect of the test was not as straightforward as might first appear. Hubs are passive devices; as long as there are no problems, they should forward traffic at wire speed. But once bridges and routers come into play, it's another story.

To determine how much latency is introduced by internetworking devices, the Data Comm Test Lab compared throughput on same-segment links with that of two segments linked by bridges. In all cases, the Lab ran the tests on an IPX LAN running under NetWare version 3.11. The Token Ring tests used network adaptors from Olicom, while the Ethernet tests used Etherlink II adaptors from 3Com. All tests were run over UTP wiring. All the frame transfers were timed with Perform3, a public-domain utility included with NetWare. The frame sizes were verified by an Expert Sniffer LAN analyser from Network General.

For the Chipcom, Lannet, and Xyplex hubs, and Lab used the vendors' internal bridging modules. Although Bytex does offer a bridge/router module, it did not supply the Lab with the necessary bridging software. For that reason, the Lab employed Olicom's Wire-Speed Local Bridge.

In testing Ethernet port-switching hubs, the Lab measured the time it took 64- and 1,024-byte frames to travel from one port to another, both on same-segment links and across two segments. For the Bytex hub, which handles Token Ring traffic, the Lab added 4,096-byte frames. The ultimate goal was to show how much slower bridged links operated than same-segment ones.

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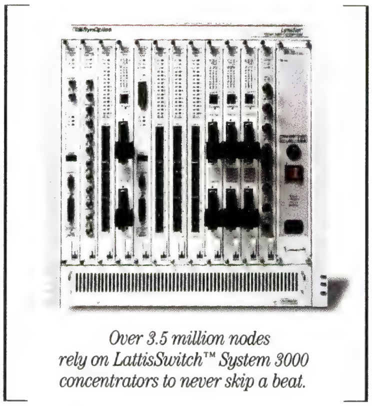

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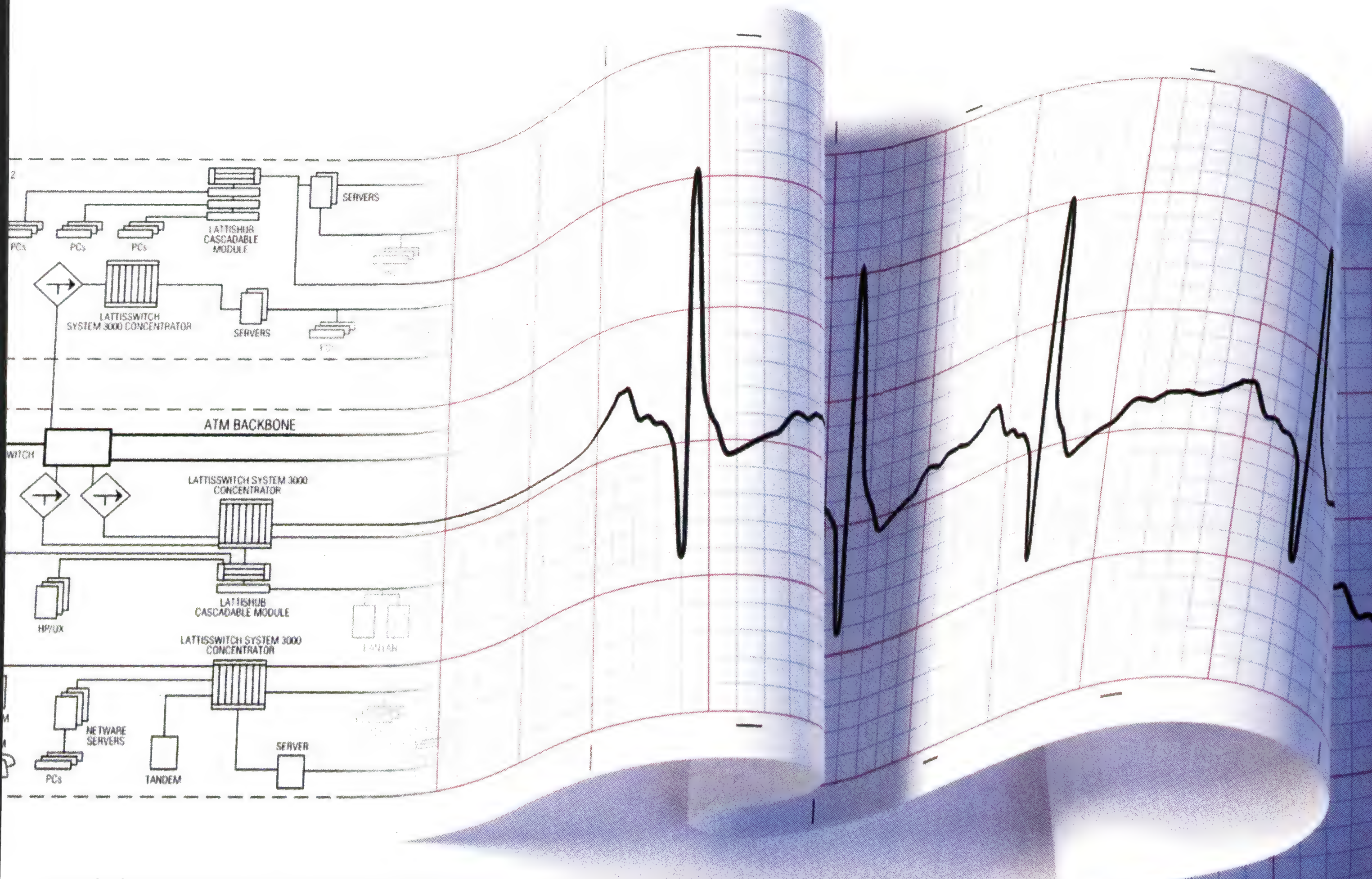
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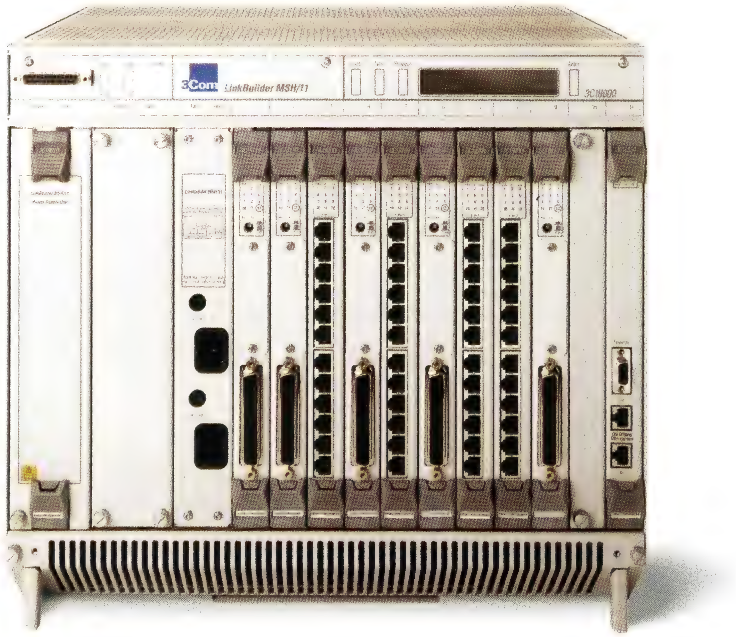

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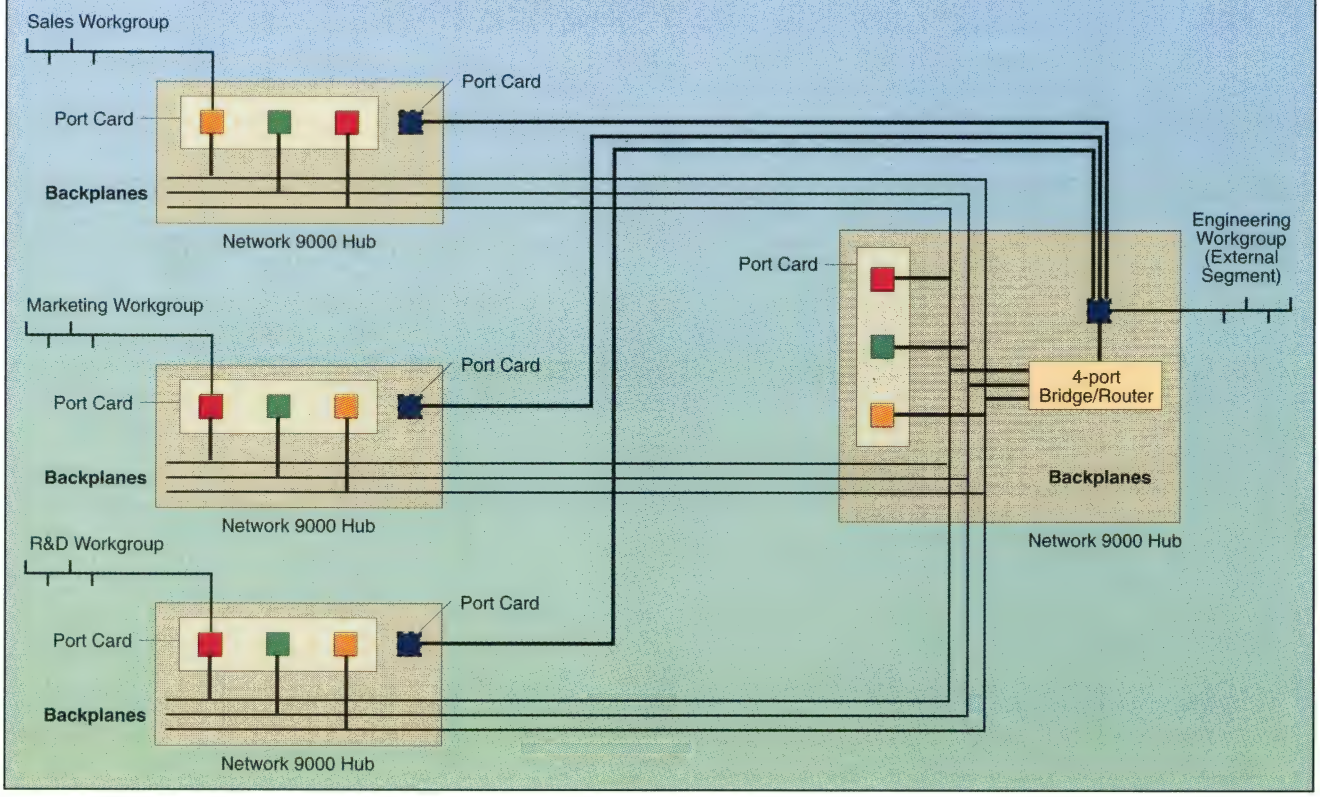
Figure 5: Xyplex's External Segment

Xyplex's hub supports three segments on its backplane. To add a fourth segment to each hub, the vendor added a port card that is not attached to any backplane. A bridge/router module is linked to all four segments.



The actual frame sizes were larger than those specified. IPX adds packet headers, increasing overhead traffic on the network. In sending 64 bytes of payload data, for example, there was as much as 65 additional bytes of header information.

Test Results

As expected, bridging had a significant effect on throughput. On same-segment links, throughput was almost identical for each vendor's hub (as it should be). On bridged links, however, data travelled anywhere from 15% to 58% more slowly than on same-segment links (see Table 2).

Chipcom's internal bridge was particularly sluggish: It introduced bridging delays of more than 50% in sending both 64- and 1,024-byte frames; the next-highest latency was Lannet's 31% with 1024-byte frames. All three vendors of Ethernet hubs offer internal bridge modules, each with substantially different performance. The external Olicom bridge used with Bytex's hub yielded the smallest changes between bridged and same-segment throughput.

The differences in throughput show how important the choice of a bridge can be. Generally, vendors purchase bridging and routing software from industry leaders like Cisco Systems or Wellfleet Communications, and then build their own hardware.

Internal bridges and routers have some advantages over external versions, like a smaller footprint and the convenience of one-stop shopping. But vendors may have to re-engineer the bridging or router software for their hardware, and performance can suffer.

Kevin Tolly is director of the Data Comm Test Lab and president of Interlab. He is based in Sea Girt, New Jersey. David Newman is testing editor for Data Communications magazine, based in Boston.

The ATM Alternative

While the multiple backplanes of a port-switching hub make more bandwidth available where it's needed, there are still limits to throughput on individual segments. A workgroup with high-bandwidth requirements is likely to discover that even small segments aren't sufficient to handle their needs. And once bandwidth runs out, no amount of bridging and routing will help.

That's where ATM (asynchronous transfer mode) comes into the picture. ATM's mix of cell switching and high data rates allows bandwidth to be dedicated to a segment when it's needed and switched elsewhere when it's not. Many forecast ATM's adoption on corporate backbones and conclude that port-switching hubs are an interim solution.

But ATM products are only starting to appear, and their high prices will probably preclude their use in desktop LANs for years to come. Since port-switching hubs preserve corporate investments in Ethernet and Token Ring adaptor cards and other LAN equipment, they may find favour at the departmental level or as devices for creating virtual workgroups. In fact, it ultimately may become commonplace to build corporate internets that use ATM on the backbone and port-switching hubs at the departmental level.

What's more, port cards with switching capability cost only a few hundred dollars more than cards that don't have it (although a port-switching chassis still must be purchased). In the future, Ethernet port-switching hubs might offer dynamic switching — a feature already available in the Etherswitch from Kalpana. However, Token Ring port-switching hubs are less likely to add dynamic port switching because of the complexity of the topology.

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  Via adaptors — V.35, V.36/RS449
- Remote control

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  G.703 co-dir., V.24/RS232C, V.11/X.24
  Via adaptors — V.35, V.36/RS449
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- Framed receiver
- Mux/demux
- Remote control

PF-25 Bit Error Analyzer

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- Interfaces:
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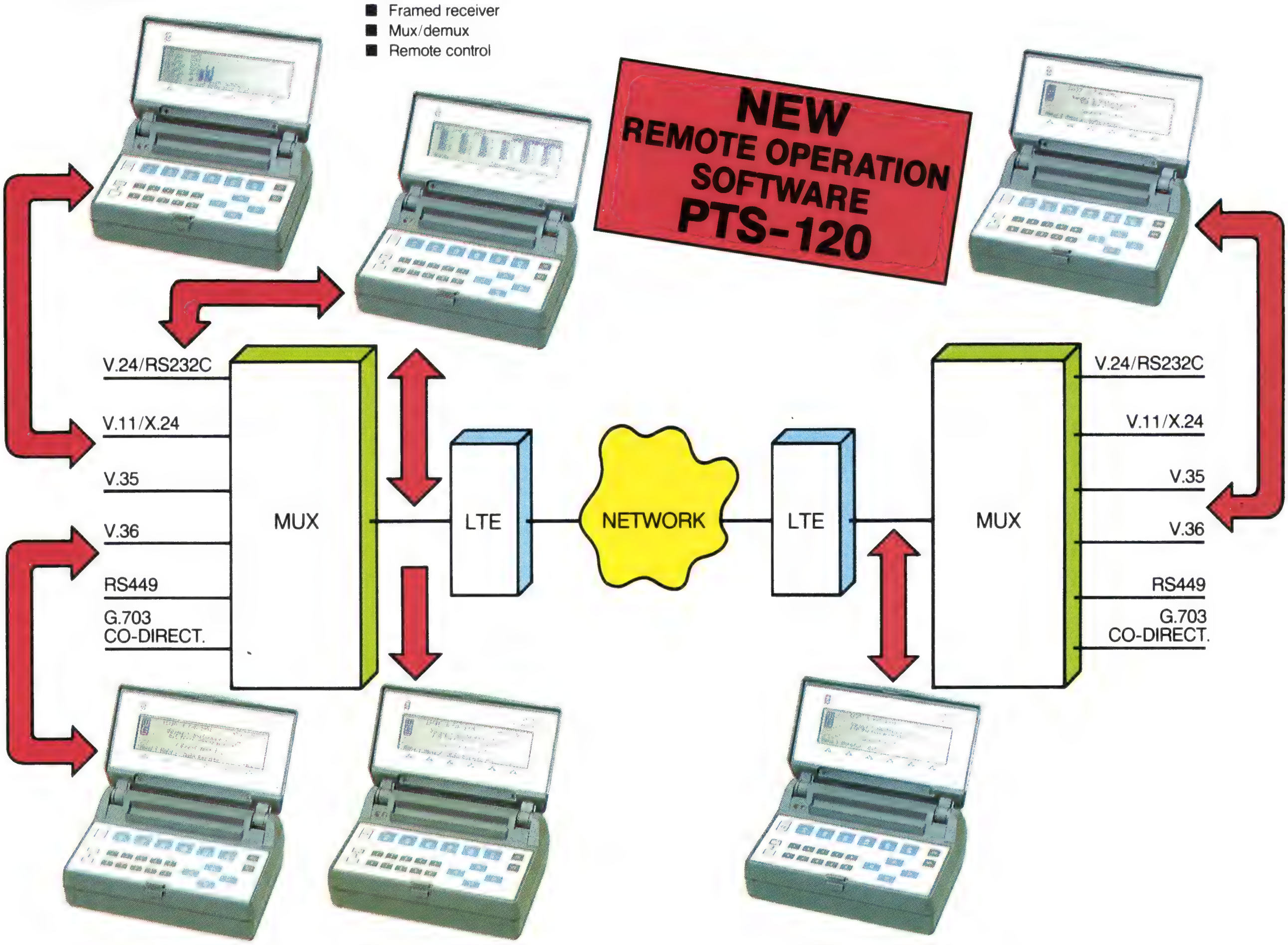
  Via convertors — V.11/X.24
  (via IC-21), V.35 (via IC-35)



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Kester Cranswick

Time to Cash In on the Internet?

Originally an academic and research network, the Internet has grown to encompass a range of diverse groups, and a growing number of people now say it should be available for commercial traffic.

Enter the Internet and you enter a different world, a world with a population almost equivalent to Australia's. According to the last census, it has nearly 1.5 million hosts, up 67% on twelve months ago. Of the 175 countries connected to the Internet, Australia is the second heaviest user, behind the United States.

The Australian end of Internet, AARNet (the Australian Academic and Research Network), has around 60,000 computers connected to it, and 300,000 users. A year ago, network traffic was 650 gigabytes per month, and growing rapidly.

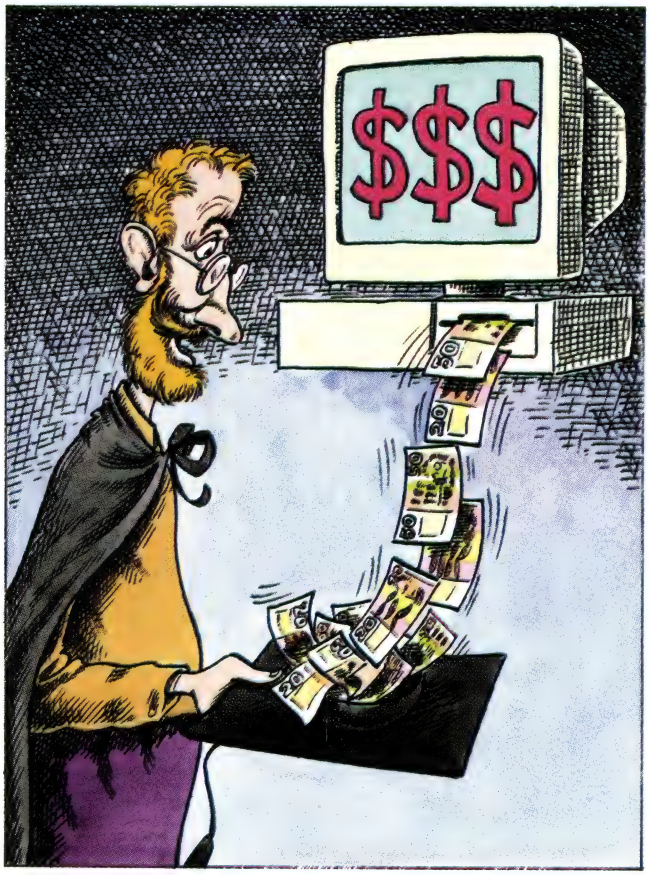
AARNet is run by the Australian Vice Chancellors Committee (AVCC) and links 36 tertiary institutions, CSIRO divisions and another 250 private and public organisations. The hosts are connected to a 2Mbps backbone running from Perth, via Adelaide and Melbourne, all the way to Townsville, with a 256Kbps link to Hobart and a 128Kbps link to Darwin. AARNet is, in turn, linked by a 0.5Mbps link to the Internet network. This month, a T1 link to the US will be commissioned.

The rulebook says that AARNet can be used in connection with the administrative activities of the member organisations of AARNet. Use for institutional support services, in support of the various infrastructural service support activities associated with the academic and research enterprise, are considered to be an acceptable use of AARNet. Traffic relating to the national academic and research enterprise and related commercial traffic, or traffic originating from peer academic and research networks which conforms to the originating networks' acceptable use policies is in general considered acceptable traffic to be carried over AARNet.

But AARNet is not designed to be a service for the general public. It is not advertised; you cannot dial a number, fill in credit card details and start using the system.

Nevertheless, there is a growing push by the business community to open up the Internet to commercial users. In fact, many Australians are already using the Internet for commercial purposes. Tony Goodman, General Manager of XSoft Australia, has his Internet address printed on his business cards. XSoft, a subsidiary of Fuji Xerox, has an Internet connection out of Palo Alto in California. Goodman said it takes only ten minutes to get an e-mail message from his customers in Sydney. "Because I'm using an existing service, it's very cost effective," he said.

Another user is Peter Moore, Business Development Manager, Core Systems, at Intergraph. He prefers the Internet to the phone when it comes to communicating with Phil Meyer, Windows NT Product Manager at Microsoft Australia. E-mail messages are routed from Sydney to Intergraph offices in Hong Kong and Alabama, then through the Internet to Microsoft in Seattle and back to Sydney. All this, and the two communicators work barely more than a stone's throw apart.



The man in charge of the network is Peter Saalmans, General Manager of AARNet. He took on the job in May, after five years abroad as communications manager for a large bank. "I feel that I've been given the keys to look after the crown jewels," he said.

What is AARNet Used For?

Almost any branch of human knowledge is catered for by the AARNet database. Topics are covered by newsgroups and/or databases, and if you can't find an existing group of users with the same interest as you, set up your own group.

Some of the varied range of subject areas include aviation, computer science, engineering, genealogy, journalism, literature, mathematics, music, politics, sport, religion, science fiction and travel. Some of the more obscure resources include a collection of records from the Australian Institute of Aboriginal Studies and the ANU (ANU-aboriginal-studies.src), a collection of home-brew recipes, reviews of Dante's works, a database of guitar chords, databases about the Simpsons, Monty Python, Star Trek and a large database of Polish jokes.

In researching this feature, *Australian Communications* used AARNet to solicit user views on AARNet. A wide range of responses were received, indicating a variety of activities and views. Paul Harris, of the Agricultural Technology Department at the University of Adelaide, has been using the news facility for 12 months to find and provide useful information. "It is a good way to contact people, often quite fast (1 hour response) and more convenient than phone — you answer when it suits you and have time to consider what you say," he said. "It keeps you in contact with people around the world, helping to overcome the tyranny of distance."

Another South Australian user accesses the shadows of a Finnish archive and a US archive on a daily basis, as well as services in Switzerland and other countries. "I have consistently been able to provide information for the University of South Australia both in areas related to my job and other areas, which has saved many days searching work or the duplication of work," he wrote.

Robert Harris, a professional working 1,800km north of Perth, finds AARNet gives him the information and contacts needed to perform his job. "I always ask companies that I start dealing with if they have Internet connections. Luckily, in the IT field this is nearly always the case for large organisations. I anticipate that in a short while I will look at potential suppliers, and deal only with those who have Internet connectivity," he said.

Aris Theocharides, a Masters student at the University of Melbourne, makes use of AARNet every day. "I read and contribute to newsgroups relevant to my work; access national and international library databases and find public domain programs that someone remotely may have written that I can use or modify, keep in constant contact with people overseas, communicate with colleagues and students via electronic mail, and submit papers to journals by e-mail in a standard format, thus avoiding errors due to fax machines and photocopies," he said.

Jamie Honan, a Sydney-based consultant, uses AARNet as an information tool. "When I am connected, I have no sense of distance. One moment I am reading and replying to an article posted by someone in Sweden. I have only a vague sense of where they are. However, I have a sense of shared intimacy, because I and the remote person share a set of common assumptions and values. We arrived at these common values independently, despite cultural, linguistic and other differences. Our ability to communicate reinforces these values. The danger is that they become so reinforced that we lose touch with other values that are needed for day-to-day life," he wrote.

Kester Cranswick

But the needs or wants of business users is of little concern to Saalmans. "Our prime responsibility is towards the academic and research sector," he said. If commercial users want access, he suggests direct gateways to commercial networks such as CompuServe are the answer.

CompuServe, known in Internet circles as Compu$erve, is broadening its links to the Internet. The maximum message length and file size has been increased from 512K to 2M, and Internet users with a CompuServe account can now get full, on-line access to CompuServe through the Internet.

Stuart Broad, Manager of CompuServe Pacific, recognises it as a potential competitor, but is not losing sleep over businesses using commercial links to Internet, even though it is difficult to compete against the price/performance, he said.

The dilemma for would-be commercial users is whether to make AARNet commercial, or encourage a parallel, fully commercial network. There are local companies selling limited access to AARNet, companies such as Pegasus and Connect.com. Saalmans is relaxed about service providers such as these, saying that their usage fits in quite well with the AARNet policy. However, that policy is being reviewed.

Connect.com.au is Australia's first commercial high-speed gateway to the Internet. It offers one-hour-per-day access to Internet e-mail, news and FTP services, for an annual connection fee of $2,000. Established a year ago, it has almost 100 customers.

The advantage of the Connect.com service is that users get interactive, full-time connection to the Internet, so they can access files and other users in real time. The service is aimed at the corporate market and makes it easy for network managers to control connections and e-mail. "An organisation has a distinct Internet identity, rather than being a collection of individual accounts. You run your own machines to do the things you want, such as aliasing, and control your own mailing lists and file distribution within your own organisation," said Managing Director Hugh Irvine.

Irvine expects to be able to offer a full, commercial, direct connect IP service by the end of the year. "We have the fabric, in the form of a national network, and the point of connection. The only thing we are missing is a link to the US," he said. "When we get that, the AARNet rules of use won't apply." Irvine does not believe AARNet should be opened up to commercial traffic. "Why should a taxpayer pay for BHP to send and receive data?" he asked.

AARNet's Technical Manager, Geoff Huston, has strong views on commercial usage, believing it should be accepted. "The technology is expansionist," he said. "In the US, the bulk of the growth has been in commercial users."

If businesses could use the Internet — via AARNet or a commercial network — what would they do? Xedoc Software Development, which has been using Connect.com to get access to the Internet for over three years, would like to be able to ship updates and new products over the Internet. Xedoc has come to rely upon the Internet. A Melbourne-based supplier of cross-platform solutions which has particular expertise in the Apple and NeXT markets, Xedoc uses Internet e-mail to communicate with US vendors and support customers in Australia and around the world. "We actively publish our Internet address and encourage electronic enquiries," said Brett Adam, Director of Marketing. "If we didn't have it, we would be crippled."

Gaining access to FTP and remote access features make remote customer support easier. Xedoc is working on ways to be able to Telnet into customer machines and fix problems over the network. Xedoc uses Internet news groups to get the drop on industry happenings, publicise its products and get technical assistance for porting products to different platforms. "Using the Internet, I learned enough about HP Assembler to write valuable routines for our libraries," said Adam.

He actively watches discussion forums, contacting people who pop up and who could be customers for Xedoc products, something Adam calls guerrilla marketing. He also uses the Internet for social purposes, such as receiving regular mailings of Apple jokes from staff at Apple in the US.

His commercially focused usage makes him critical of AARNet's management.

"They have no concept of what they have control of," he said. "Academia may be a great place for prototypes, but you really need the kind of quality that commercial organisations bring to a product or service. By keeping it academic, I think they will miss a great opportunity."

"AARNet is in a unique position in that it has an excellent TCP/IP backbone that stretches throughout Australia, and so it could easily provide backbone services for commercial entities," said Rhys Weatherley, President of the Brisbane Public Access Network Association (BrisNet), a non-profit association providing mail and news to individuals and small businesses in the Brisbane area. "It is probably the only network that even has a chance of providing such services in this country, as AARNet and the AVCC has an effective lock on the large network scene," he said.

The main disadvantage cited for commercial use of the large networks is businesses flooding the network with advertising and other junk. "Such claims are overblown, and are merely used as an excuse not to open up the networks to wider use. Businesses that have contacted BrisNet about connections are interested in talking to their counterparts overseas via e-mail, not advertising," said Weatherley.

The other side to this is that if AARNet was to become a commercial service, it would have to provide a level of support and service above what is provided at the moment. "Operating as a private concern under the auspices of the Vice Chancellor's committee is not the way to do this," added Weatherby.

Ian Yates, Manager of Desktop Systems at the University of Sydney, is keen to have private sector users on the AARNet, because it would mean more money to grow the network. He sees only one drawback — it might bring in so much money that university funding is cut! (That is, if AARNet could work out a way to charge for usage. Annual access fees may not reflect the cost of routing or the amount of traffic, and if a per-kilobyte charge is introduced, users may find themselves being charged big bucks for junk mail.)

Australia may be right on the edge of there being a critical mass to make a commercial network happen, says Simon Hackett, founder and Technical Director of Internode Systems, a TCP/IP networking and communications company based in Adelaide. "But Australia is not big enough to justify a parallel network. It would be much simpler for the AVCC to let someone run the AARNet commercially. The impact would be a lot more money to beef up the network," he said.

There may be more to this than idle fancy. Geoff Huston claims the universities aren't necessarily committed to running AARNet. "They needed it at the time," he commented.

While commercial users may be able to pay their way on a commercial AARNet, spare a thought for the thousands of university leavers who suddenly find themselves disenfranchised after graduation. AARNet's Saalmans has real sympathy for them, providing they are not after taxpayer-funded access. "There is a gap in the supply side of the market," he said. "However, I don't have sympathy for people who demand use of the AARNet. In the US, where the Government has invested millions, they might have a case. Not here."

Getting On-Line

AARNET NETWORK AFFILIATE

Annual Access Fee	Rights
$5,000 p.a.	Dial in at 9.6Kbps or lower
$8,000 p.a.	9.6Kbps capacity — leased line or permanent call
$15,000 p.a.	19.2Kbps capacity — leased line or permanent call
$25,000 p.a.	48Kbps & 64Kbps capacity
$30,000 p.a.	128Kbps capacity
$35,000 p.a.	256Kbps capacity
$40,000 p.a.	512Kbps capacity
$45,000 p.a.	1Mbps capacity
$50,000 p.a.	2Mbps capacity
$60,000 p.a.	10Mbps capacity
Connection Fee	
$3,500	Connection to a single AARNet Cisco router interface
$1,000	Connection to a single AARNet SLIP/PPP server interface

AARNET MAIL AFFILIATE

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$4,000 p.a.	Established high volume category (over 4Mb/month)
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CONNECT.COM

Hugh Irvine Tel: (03) 528 2239; Fax: (03) 528 5887
Fees: $2,000 per annum gateway connection

DIALix

Box 371, South Perth, WA 6151
Fees: 1 cent/minute of connect time; 1 cent/kilobyte for e-mail (not news). Mail and file transfer within the DIALix network is not byte charged. Each account has 1M of storage space allocated at no cost. Additional storage costs $10/M/annum

For more information AARNet can be reached on Tel: (06) 249 3385 Fax: (06) 249 1369

AARNet and the Internet

It's important to distinguish between AARNet and the Internet. The Internet is a collection of interlinked networks, of which AARNet is only the Australian node.

AARNet provides interconnections between the local area networks of its client members and other networks within Australia and overseas. AARNet itself does not provide services to end-users; it enables users of systems that are connected to AARNet to access resources and services made available by other members of the network. Thus, there is no AARNet user ID and password. Users must be sponsored by a member organisation to use the system, and the fee structure is set up so as to discourage individuals from having direct TCP/IP connectivity.

There are two basic connection services offered by AARNet to its members. Mail Service enables an affiliate organisation to exchange electronic mail with AARNet. Other services that may be layered above electronic mail transfer or similar store-forward messaging-based connections, such as network news, can also be used. Network Service provides full TCP/IP network-layer connectivity to AARNet and the peer networks that make up the Internet. The full range of services supportable by TCP/IP is available to network affiliate members, including remote login, file transfer, electronic mail and access to on-line information servers, just to name a few.

AARNet's equivalent in the United States is the National Science Foundation's NSFNET. The United States also has a number of private sector networks, such as UUNET, PSI and SprintLink, connected to the Internet, and these networks are available for commercial traffic.

Australian Internet access was originally provided through Melbourne University, using X.25 links to UUNET. Other universities could use the access, for a fee, and this

The Internet's Leading Edge

Despite user complaints about a lack of interfaces, the Internet network is truly leading edge.

This year saw some incredible demonstrations of Internet multimedia capabilities. Sessions of an Internet conference in Amsterdam were broadcast across the network with live audio and video and an interactive whiteboard. Any Internet user who had an audio-capable workstation (SPARC, SGI, DEC 5000) and IP multicast software added to the operating system could sit in on a session. The transmission took around 312Kbps of bandwidth.

Internode's Simon Hackett is famous for connecting a toaster to the Internet, controlled by SNMP. At the 1990 Interop, a Sunbeam Radiant automatic toaster was rigged to a controller and fed variables (how many slices of bread, how long to toast) through SNMP. The toaster then cooked the bread, getting a round of applause every time the slices popped up. He has also connected a CD player and a radio, again using SNMP. The CD player used a motorised, 68000-based SNMP controller and could be operated by Hackett from an X Windows session anywhere in the world.

IP multicast is a way of sending the minimum number of packets to get a signal from one node to multiple receivers. It runs over the semi-permanent virtual IP multicast network known as the MBONE. The MBONE is a result of the first two Internet Engineering Task Force (IETF) 'audiocast' experiments, in which live audio and video were multicast from the IETF meeting site to destinations around the world. The idea is to construct a semi-permanent IP multicast testbed to carry the IETF transmissions and support more experimentation between meetings.

The MBONE is a virtual network. It is layered on top of portions of the physical Internet to support routing of IP multicast packets, since that function has not yet been integrated into many production routers. The network is composed of islands that can directly support IP multicast, such as multicast LANs like Ethernet, linked by virtual point-to-point links called 'tunnels.' The tunnel endpoints are typically workstation-class machines having operating system support for IP multicast and running the 'mrouted' multicast routing daemon.

The IP multicast software is available by anonymous FTP from the vmtp-ip directory on host gregorio.stanford.edu. Included in the distributions are files (sources or binaries, depending upon the system) to modify the BSD, SunOS, or Ultrix kernel to support IP multicast, including the mrouted program and special multicast versions of ping and netstat. Silicon Graphics includes IP multicast as a standard part of its operating system. In the IRIX 4.0.x release, there is a bug in the kernel code that handles multicast tunnels; an unsupported fix is available via anonymous FTP from sgi.com in the sgi/ipmcast directory. IP multicast will also be included in Sun's Solaris 2.1 and in BSD 4.4 when/if it is released.

With these sorts of facilities, some see the Internet — and the IP protocol — as a real alternative to OSI. The Internet Protocol, in its current form, has one problem though — its address space cannot accommodate the number of users it is likely to have soon. The Internet Architecture Board, which formalises Internet protocols, is now working with the ISO to develop a new protocol, called IP2, which may well encompass the ISO 8473 connectionless protocol standard. The recently announced SIP protocol is one of several candidates in the running to become IP2.

While the IAB and the ISO are keen on IP2, there continues to be strong opposition from some academic users, who fear that to make the Internet more accessible to commercial users would be a dilution of the original purposes of the network.

Kester Cranswick

Internet Growth

ADDRESSES	JULY 1992	OCTOBER 1992	JANUARY 1993	APRIL 1993	CHANGE JULY-APRIL
Class A	60	52	54	58	-4%
Class B	2,714	2,985	3,206	3,409	25%
Class C	3,795	4,468	4,998	6,255	64%
Total	6,569	7,505	8,258	9,722	48%

Source: Internet Domain Survey

Internet addresses are divided into three categories: Class A, Class B, and Class C. Class A addresses are designed for very large networks (up to 168 million devices). There are only 128 Class A addresses available, and most have already been assigned.

Class B addresses support networks of no more than 65,000 devices. There are about 16,000 available, and approximately 9,000 have already been taken.

Class C addresses are meant for very small networks (no more than 256 devices), and there are over 2 million available.

Internet addresses are 32 bits long and are typically written as four octets. Setting the first bit to 0 indicates that a Class A address is being used. The next seven bits specify the network address; and the last 24 bits, the device address. Using a 1,0 in the first two places indicates a Class B address. The next 14 bits are for the network address; the last 16, the device address. A Class C address uses the first three bits as an ID; the next 21 bits for the network address and the last eight bits for device addresses. Thus, the way the 32-bit address is partitioned determines the number of networks and devices available.

A possible answer to the concern about the demand for Internet addresses rapidly outstripping supply has recently been proposed by the IP Address Encapsulation (IPAE) working group, which has announced the Simple Internet Protocol (SIP). SIP makes use of 64-bit addresses rather than IP's 32-bit system, and the IPAE says this will effectively double the number of possible addresses.

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Australian Made

Backdoor Access to the Internet

For those without access to university computers, there are cheap alternatives, such as APANA, (the Australian Public Access Network Association), and DIALix.

APANA is a not-for-profit organisation running a non-commercial network of computers in all mainland states except Western Australia. Machines in the network range from dial-in BBSs and Unix hosts to personal Amiga/PC/Macs using standalone messaging software, all running from members' homes. The network has been national for about a year and has over 500 members, "mostly graduates getting withdrawal symptoms," says Andrew Herbert, President of APANA.

As an affiliate member of AARNet, APANA gives members access to AARNet and the Internet. For an annual membership fee of $55, members get e-mail, an address on the APANA node, and can join any newsgroup they specify. Members access these services either interactively, by logging onto a BBS, or by using an automatic offline batching scheme based around a system known as UUCP. In addition to external traffic, APANA also has its own internal mail and special interest newsgroups. "Our ultimate aim is to provide direct Internet access (such as telnet, FTP, talk) to all our members," said Herbert.

APANA runs a permanent 19,200bps link between a cluster of Melbourne APANA machines and an Internet machine at Melbourne University. The network is linked using UUCP, SLIP and PPP. However, interactive Internet services such as telnet and FTP are presently unavailable.

Members access AARNet by dialling up and connect to a regional hub computer. They can also permanently connect into the Melbourne Internet-based cluster, though this requires two phone lines, two modems, plus an Internet Protocol-capable computer (typically a Unix box or a PC running NetBSD or Linux).

APANA has a strict policy against commercial use, though Herbert is keen to see a commercial network established in Australia. The problem is not the local links, but the cost of high speed links across the Pacific. "It is unfortunate we can't share AARNet facilities," he said.

Like APANA, DIALix offers dial-up e-mail and newsgroup connections to AARNet. The network has almost 400 users, mostly in Perth. Users pay for time up-front, are given an address on the DIALix node and software to interact with the network. Jeff Johnson, who runs the service, claims that 'user pays' is the way to go, if access is cheap enough.

Johnson would like to grow his two-year-old, Perth-based DIALix network to a national facility, and claims he is setting up a commercial network in Australia to parallel AARNet. Perth and Sydney hosts are in place, and the other capital cities and large centres will follow. His aim is to have an independent connection to the Internet, obviating the need for AARNet to provide commercial connections.

Kester Cranswick

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eventually grew to a network known as ACSnet.

The first proposal for a national network to link universities was made at the annual Networkshop in October, 1991. The proposal, based on X.25 links, was considered impractical. However, it spurred a group of delegates at the conference, led by Geoff Huston, to work up the network schema that became AARNet. The key to its acceptance was its use of off-the-shelf products. Determining which products to use and where they should be located took the best part of nine months. The actual implementation of the network only took three weeks.

The 11 member AARNet Board of Management is chaired by Don McNicholl, Vice Chancellor of the University of Sydney. It reports to the AVCC Board of Directors. Last financial year AARNet had revenues of around $4 million, from universities, the CSIRO and affiliate members. Saalmans claims that the Government subsidy component of that figure is only 12%. For that amount of money, it must be one of the most cost-effective networks in the land, particularly given a quarter of the running costs are spent on the link to the US. "Yes, it has been run on a bit of a shoestring in the past," admits Saalmans.

A 1992 report to the Prime Minister's Science Council identified the need for a national high bandwidth network if Australia was to reap the benefits of high performance computing. 'Such a network will revolutionise the ability of Australian enterprises, researchers and educators to carry out collaborative research, development and education, regardless of the physical location of the participants or the computational resources to be used,' said the report. It recommended an expenditure of between $35 million and $45 million.

In the 1992 Budget, the Government made a conditional commitment to spend some of $13.17 million allocated to the Cooperative Research Centre (CRC) program to upgrade AARNet in both speed and capacity. After a public row about how much money should be given to AARNet, last December the Government announced that $3.4 million would be provided, over five years, for network infrastructure. Dr Andreas Dubs, Assistant Secretary, CRC Branch of the Department of Prime Minister and Cabinet, confirmed that there was a community expectation that AARNet would have received more money.

The CRC money will be used on one of three upgrade options. The first is leasing more 2 megabit circuits from Telecom. The second is to install microwave links, which would benefit the capital city parts of the network. The third option is to go for Fastpac.

Geoff Huston is widely credited with making AARNet so effective. A measure of his contribution to the network is that he has recently been appointed Secretary of the Internet Society. He is also chair of the Intercontinental Engineering and Planning group. As befits his role, Huston is obsessed with capacity. "I don't think we've done a startlingly brilliant job, though we're probably better set up than most countries in the region," he admits. "We also have better coverage and better accessibility."

Unfortunately, continuing growth in demand affects all users. Unlike the telephone network, which can only handle a finite number of callers at one time, when the network capacity is reached more people can still get onto the network, but every user suffers a performance degradation. "We've been riding the (capacity) issue tightly, but on a number of links we've reacted late. Network capacity needs a significant lead time," said Huston.

A common user criticism is the lack of easy-to-use front ends. Sydney University's Yates has found LAN Workplace for DOS a useful tool in the NetWare environment, and Nunties a good Macintosh news reader. "But any BBS is streets ahead of the Internet in ease of use. Even the real Unix propeller heads have a problem occasionally," he said. Xedoc's Adam describes the popular Waffle/Helldiver toolset for MS-DOS/Windows as "a patch on top of a Band-Aid on top of a piece of string." Macintosh users have better products, such as Eudora.

Other users who contacted *Australian Communications* via AARNet had similar views. "Some of the interfacing software could be much improved, specially through the use of the PC industry's expertise in user interface design," said Brisnet's Weatherley. Users also point out that many mail packages lack Internet mail facilities.

This clash between academia and commercialism neatly represents the dilemma now facing AARNet. It is a network Australia can be proud of, but as Australia's premier means of accessing Internet resources, a way must be found to allow commercial usage without alienating the academic community.

Kester Cranswick is a freelance journalist based in Melbourne.

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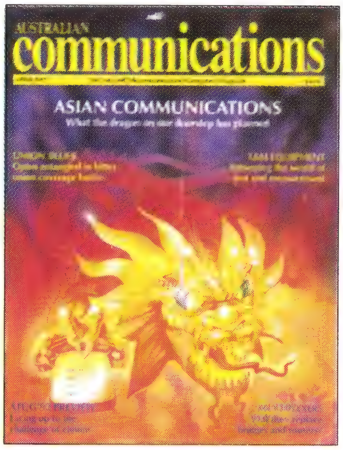

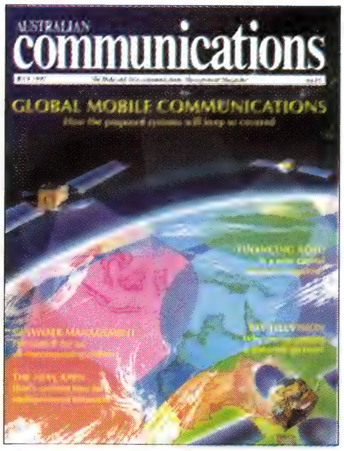

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Taking a New Look at Mobile Data

With Telecom and BellSouth gearing up to provide mobile data services, Stewart Fist examines the industry and the emergence of CDPD, a new technology that might radically change it.

Ericsson's Mobitex digital mobile radio system has been fighting it out for market dominance with Motorola's Ardis in the US and Europe for a couple of years now, and it's been around even longer in Europe. Over the years these systems have also had growing competition from hybrid (voice and data) trunked radio networks on one end of the business technology spectrum, and from paging systems on the other. Two-way paging has become feasible in recent years, and Dowty's Cognito approach exploited this type of technology in the UK until its financial demise (and recent resuscitation). There are also similar smaller-scale systems used in large warehouse complexes to transmit bar-code and 'picking' information back to the central computer.

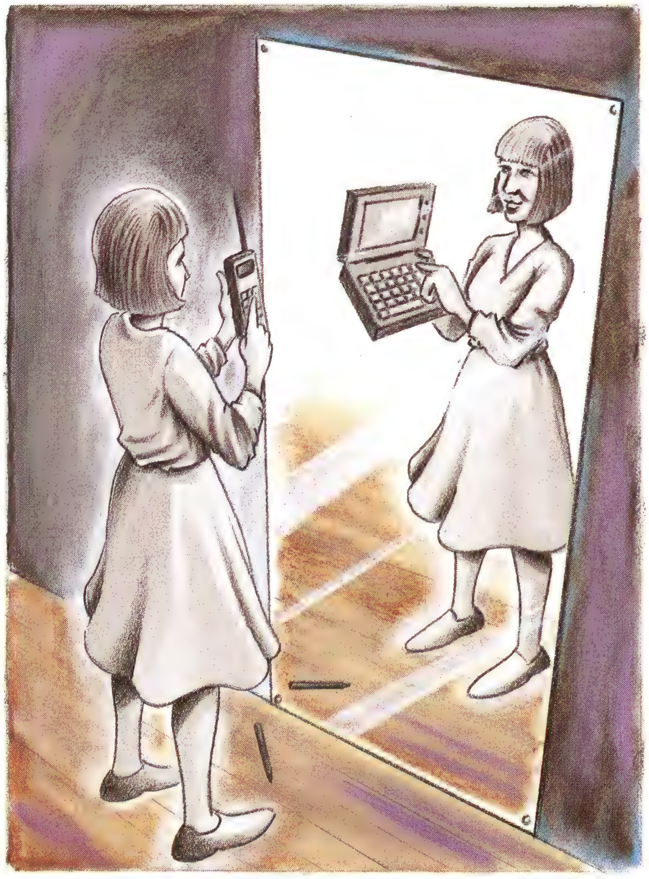
You can also use analogue (modem) data over cellular systems, but generally the maximum reliable data rates are 1.2 and 2.4Kbps; generally those who have experimented with 4.8 and 9.6Kbps data rates report that the systems are too unreliable. Only about 2 to 3% of cellular phone users ever try modemised data over the cellular network, apparently — although AT&T Paradyne has recently released details of a new ECT (Enhanced Throughput Cellular) protocol that could make this approach work.

But current mobile data technology for public-access and private networks is being challenged by the imminent arrival of an IBM technology called CDPD (Cellular Digital Packet Data). With CDPD, data is riding on the back of cellular voice telephony networks — gaining automatic coverage by re-using network infrastructure. Potentially this could be the low-cost solution to the mobile-data problems.

A Number of Options

The requirement for mobile data hasn't grown more than a few percent per annum in the last few years; but perhaps that's all about to change. The increased emphasis on portable computers, and the imminent rush of Personal Digital Assistants (PDAs) coming onto the market this year, must push mobile data services onto centre stage fairly rapidly — and there will be a wide range of different service types. These services can be characterised as being:

- *One and Two-Way Systems* We tend to call the one-way systems 'paging,' and the two-way, 'mobile data,' but in between there are now 'interactive pagers' which can transmit a pre-determined reply (from a customisable list held in the pager) back to the base station. There's also a whole range of radio-modem PC/PDA/tablet combinations with varying degrees of one and two-way radio capability with plug-in modules.



Tone, numeric and alpha-numeric paging has been a cheap technology for mobile communications in Australia now for a decade or so. In fact, we have an extremely high relative penetration of alpha (as distinct from numeric or tone) pagers in the world; ten times that of the US. Of course we don't have the numbers, or the penetration of some other countries. In Taiwan and Hong Kong, for instance, pagers appear to be compulsory. In this article, I am concentrating on full-blown two-way data systems.

Why Packetise Radio Data?

Firstly, with a packet system you can ride on the network all day, exchanging short messages and not be charged for time but only for usage (on a per packet rate).

This 'constantly-on-line' approach has a secondary advantage where location-tracking is important, either for the network itself, or for the customer. When coupled with Global Positioning Satellites it is possible to track thousands of delivery trucks through a city with a precision of 50 metres or so. Single packets of data only need to be delivered back to the base by mobiles on the move, and then without the preamble of setting up a circuit, handshaking, etc. Call set-up and tear-down times are the curse of short messaging and transaction systems.

Secondly, radio systems are fundamentally short-message, broadcast systems, and with a packetised network you can broadcast general-information short messages to everyone on the base station's frequency, and rely on the mobile unit to select out information for the intended user/s. Packet systems do this through an address in the header, and this makes possible one-to-one, user-group and all-mobiles broadcasting. So the same network doubles both as a point-to-point messaging service and as a general information source.

Thirdly, the packet approach is much more robust for mobile data, since the base technology is much more tolerant of non-contiguous, erratic flows of bytes and lost data. All packet networks have built-in methods of handling errors and restoring lost data after signal disruptions. This is especially important in cellular networks where 'hard' hand-offs occur between sectors, or between cells.

And lastly, packet systems tend not to block calls in the busy hour. Rather than prevent access, they slow message delivery under load conditions, and spread the pain evenly across the network. This approach is a fairer allocation of network resources: one user can't easily hog the network. This is important for customer harmony in a public-access network.

Stewart Fist

- *Private or Public-Access Networks* For mobile data users, each has advantages and disadvantages. Until recently, public-access networks have been unknown in Australia except where they are an adjunct to a trunked radio telephony system, but now this is changing. Private networks for emergency services (police, ambulance and fire) and for taxis have been around for some time, and are now quite sophisticated; many of them use variations on the Mobitex and Ardis technologies.

The trade-off in making a private vs public choice is complex but essentially is one of cost/capacity vs coverage area. Very few private networks can achieve the coverage of a public-access network, but if substantial amounts of data are being transmitted constantly, then public networks can prove to be very expensive.

- *Dedicated or Hybrid Voice/Data Networks* There are now a range of hybrid-backbone radio network technologies in use, whereas previously mobile data was carried by dedicated data networks. You can piggy-back (using modems) data functions on voice systems such as the old two-way public or private mobile radio (PMR) systems or trunked radio networks. But mobile data is now also included as a sub-section of digital cellular networks (GSM Phase 2 and D-AMPS). But neither of these TDMA digital telephony technologies has data protocols functioning at the present time; you'll need to wait until at least 1995. Don't confuse this with GSM's Short Messaging Service (up to 160 characters) which is actually an extension of the signalling system, just like User Data on ISDN's D-channel — it uses a packetised approach on what is essentially a circuit-switched network.

Pure data over circuit-switched digital cellular radio still has many unsolved problems; so, at present, the digital phone network isn't offering anything that can't already be done by analogue cellular. If you are going to transmit data, you need a modem, and you'll be wise to have your vehicle stationary. AT&T Paradyne claims to have a protocol better able to handle these cell-hand-off problems which are presently disrupting mobile data links.

However, a characteristic of mobile data networks is that they are used to send short messages, and these hybrid (and some dedicated) networks are circuit-switched. So since the set-up and tear-down time of a circuit-switched radio channel is typically between 5 and 10 seconds, and yet message transmission is measured in milliseconds, they are inefficient. This is why packet-data transmission appears so attractive.

- *Circuit vs Packet-Switched* In the past, as with wire-line, you were allocated a channel (FDMA), or a time-slot within a channel (TDMA), to make a call, and you had exclusive use of that channel/slot for the duration of the call. This is the circuit approach and calls are generally charged on a time basis, since you are occupying an identifiable segment of the network's resources for the duration of your call.

With circuit switching there will always be a finite number of channels available for users — each with a defined and reserved section of bandwidth.

When all channels are in use, further callers will be blocked from access. So set-up time, call-blocking and time-based charging are three aspects of the circuit-switched approach that makes it unattractive.

Packet-switching changes all this: Packet-switching data systems are charged on data-bytes delivered, not on time, so you can sit on the network all day listening for a call, and not incur charges. Calls aren't blocked either on a packet network; when the system comes under load during the busy-hour, all users will continue to have access, although messages may be delayed.

These are usually store-and-forward systems, although the delay may only be seconds. E-mail is, of course, a store-and-forward type operation, and if the mobile user is temporarily out of contact (in a tunnel, for instance) or the vehicle is unattended or the driver is fully occupied with other more important activities (like driving) the message doesn't require instant attention.

The various air-interface standards will also play a part in differentiating services, and the main ones are Mobitex, RD-LAP, Tetra (data only and voice/data), CelluPlan II and GSM Phase 2. I guess we should add CDPD here also — although it seems to be a variation on CelluPlan II. Private packet-radio networks tend to favour a variation of CSMA/CA (collision avoidance) or an Aloha (polling) approach.

Different service requirements are also reflected in different network designs:

- In some applications a short message going out from the base station with a pre-defined code reply in return, may be enough. Some networks are designed around these requirements and work well in single-driver vehicles.
- These days though, most people will want two-way short-messaging or formalised radio electronic mail, possibly as an extension to their existing e-mail services. This is really the current state of the technology in public-access mobile data networks.
- Others may have a requirement for large file transfers, and here circuit-switched private radio networks may be more cost-effective.
- Then there's remote computer access. This imposes more substantial requirements on network capacity and hold-times, and can create blocking problems. The new networks will probably develop to support this growing requirement — but large numbers of users will only be possible with smaller cell structures and multiple access channels.

With the increased emphasis on portable computing, some companies will certainly want to provide real-time LAN extensions to their field workers. The requirements here may extend to allowing the remote worker to remain on the network for extended periods and having full access to his/her office LAN and mainframe resources. At the other end of the scale the requirement may only be for short duration transaction processing.

Just to fill these categories out, there's also the use of radio links as a wire-line alternative for fixed installations also. So the potential number of users of data-over-radio could be very high in the near future and fortunately, with packet-switching technology the efficiencies are much higher than with voice/circuit switching; probably 50 or more times the number of users can be serviced on the same bandwidth allocation.

Why So Difficult?

There's little doubt that until recently, with both wired networks and radio links, that voice technologies have been far more advanced than data. When you think about it, you'd expect that data over radio links would be much cheaper and easier than transmitting voice in most circumstances.

Yet Morse code wire-line and radio transmissions preceded voice telephony by 50 years, because binary data was easier to transmit and receive than analogue voice. On-off switching was more immune to noise and system variables. So shouldn't two-way digital data be easier to transmit over radio links than complex voice waveforms?

Well, it is! But the radio technology and the wireline networks seem to have evolved faster along the more difficult voice transmission path because the markets pushed development this way. The main factors that complicate the problem are the lack of 'robustness' in some data networks when breaks are experienced in transmission due to cell-hand-off in cellular mobile systems, and the problems of multipath, which seems to confuse digital receivers. The multipath problem comes when delayed, reflected signals arrive out of sync with the primary-path signal.

But the real problems with mobile data aren't technical ones. The mobile data industry isn't just waiting for some new-fangled discovery to make it feasible; rather it is waiting for some cheap service to develop that makes it all worthwhile to the mass-user. One problem is that mobile data already competes with voice as an information provider, and voice R/T often has a higher priority and may already be installed. So mobile data is generally seen as a non-essential premium service added to something that already works reasonably well.

Andrew Parkin-White of London-based researchers Ovum points out that you've got to view this sector of the industry in two ways — as having vertical and horizontal markets: 'Vertical markets include transportation, utilities, the public sector, distribution and professional services,' he says. 'Taxis, couriers and delivery companies are interested in faster response times and more efficient dispatch operations.' Mobile data is much more efficient than voice in these circumstances.

And in these types of businesses, providing voice and mobile data across a city-wide area can usually be justified with a private network. And for those needing a wider reach, or with lesser requirements, trunked radio public-access networks provide a reasonably efficient wider-area coverage at a reasonable cost.

But this is not so in the horizontal markets — mainly the service sectors — and this is where tomorrow's public-access networks will find customers. Most of these horizontal markets are not in competition with voice: when you need a file downloaded to your PC, you aren't satisfied by someone reading it out to you over an R/T network.

Ovum has just completed a study of the mobile markets, which concentrates on these new developments. 'The early horizontal markets consist of organisations us-

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ing mobile data for applications which exist across a number of business sectors, but which are not universal — [such as] field service, field sales, remote monitoring and control, and logistics,' it says.

With the boom in portable computing and the arrival of PDAs, there are obviously now new horizontal market developments as these devices become ubiquitous with middle management and executives, both within and outside the office.

Critical Mass

The problems of digital data over radio have always been related to the market-size — it is a classic chicken-and-egg conundrum. Which comes first — the network or the potential users?

Currently, mobile data tends to be associated with fleet operations and the larger companies, so in seeking to become established in the public arena it must compete with private networks. This makes it difficult to introduce good public-access networks which the smaller user-companies need, and so achieve economies of scale.

While public-access mobile data systems are just in their infancy in Australia, they are relatively mature in Europe and America: the big names in this business are Ardis (IBM and Motorola), Automotive Data Processing (ADP), BellSouth (with RAM), Cognito (Dowty), DBP Modacom, Digital (DEC), Ericsson Mobile Communications, Hogia Communication, McCaw Cellular, Motorola, NorTel, Pacnet, RAM Data, Swedish Telecom-Radio, Telxon and Vodafone.

You'll probably have heard by now that we'll soon have BellSouth using Ericsson's Mobitex system in Australia (as used by RAM Mobile Data in the US), and Telecom is suddenly hotly contesting the market with Motorola's Ardis system. These are both to be public access networks using packetised data transmissions.

Telecom's DataTAC network will run in the 800MHz band at a 19.2Kbps data rate (but they don't specify 'throughput' without the error overheads!), which still looks pretty fast by radio-modem standards. Although the technology was devised by Motorola, it is an 'open standard' which means that there should eventually be a variety of terminals to choose from.

BellSouth's Mobitex is more 'mature' (that is to say 'older') and probably more open in its scope, but it staggers along with an effective throughput of 4.8Kbps. This is still a faster rate than the European Mobitex networks because BellSouth has decided to use the latest data rate standard (an actual 9.6Kbps because of the 100% error correction loading) set by the Mobitex Operators Association (MOA).

BellSouth and RAM are in partnership in the US with this technology, and there are quite a few other public-access network operators around the world using it — so it is well tried and tested. The system has a hierarchical architecture with a three-level cellular system of nodes: base stations, area exchanges (the connection point for fixed terminals) and main exchanges, which are attached to a supervisory Network Control Centre to configure, control and manage the entire network.

This is a distributed intelligence concept which is robust in the event of a failure in the wireline links; the bases can continue to operate independently, since all location information is transferred to the base during each hand-off. Mobitex is packetised, with a fixed packet length of 532 bytes (512 byte payload), and it can encapsulate Ethernet and X.25 if required.

Although the Mobitex technology was defined originally by Swedish Telecom and built and developed by Ericsson, it has now been released as an open standard, and all development is supervised by the MOA. This admirable process has resulted in a wider range of cheaper terminal equipment.

Telecom hasn't released any details of its proposed DataTAC network, but BellSouth says that it will start with five base stations each in Sydney and Melbourne and build to the point where it has 78 base stations Australia-wide (in all capitals) by late 1995. The main features that the company is promoting at present are some basic applications which extend from simple e-mail, up to file-transfers to a laptop PC.

The estimates given by BellSouth executives for the cost of using BellSouth's system were about $30 per terminal installation fee, and then between 5 and 20 cents per packet, depending on the time of day. A packet has a payload of 512 bytes — so the network can shift quite a few words of text for the cost of, say, two phone-calls.

BellSouth is also planning to introduce 'Acknowledgment Messaging' (coded reply only, from a canned list) services, probably using Motorola's InfoTAC 'Personal Data Communicator' — a device that is half two-way pager, and half radio modem.

InfoTAC has a 10K message buffer, flash ROM for software, an SR-232 port, support for the AT command set, and it comes in flavours suitable for use on the 450MHz, 800MHz and 900MHz bands. The blurb says that it allows communications on current Motorola 4.8K (MMP and MDC) protocols, and the new 19.2K RD-LAP protocols as well as the Mobitex 8K protocols that BellSouth will use — so it's a pretty versatile device. Motorola says the InfoTAC is 'small and light enough to carry in your pocket,' but others describe it as being the size of a paper-back with the weight of a house brick.

The most noticeable feature of all this new gee-whiz mobile data technology is the shift in emphasis from circuit to packet-switching. The success of the packetised approach is probably due to the same factors that make packet-switched wireline networks so successful. And packet technologies are possibly of even more importance to the public-access service provider than to the private-network user — but there are advantages to both.

Packet-radio in the private radio network area can be used to add a data layer to a company's existing two-way voice or trunked radio system. The attraction is that with private networks there are no on-going connect, transport or subscription costs — apart from some reasonably trivial spectrum licensing fees (trivial until now, anyway!). You buy the basic equipment, pay for some initial development expenses, and then implement and manage your own private network.

Bram Frank, of Canadian firm Dataradio Inc., gives as a example the US whitegoods manufacturer CAMCO, which he says: 'calculated that their annual communications expense for the dispatch, database search and invoicing applications would run close to $200,000 annually per vehicle over the public network at current rates. [And this was about] the same as the total capital cost of implementing the equivalent private network.' This is obviously an example well chosen to illustrate the value of Dataradio's equipment, but it is also a valid argument.

Unfortunately the decision on private vs public networks is rarely this clear-cut.

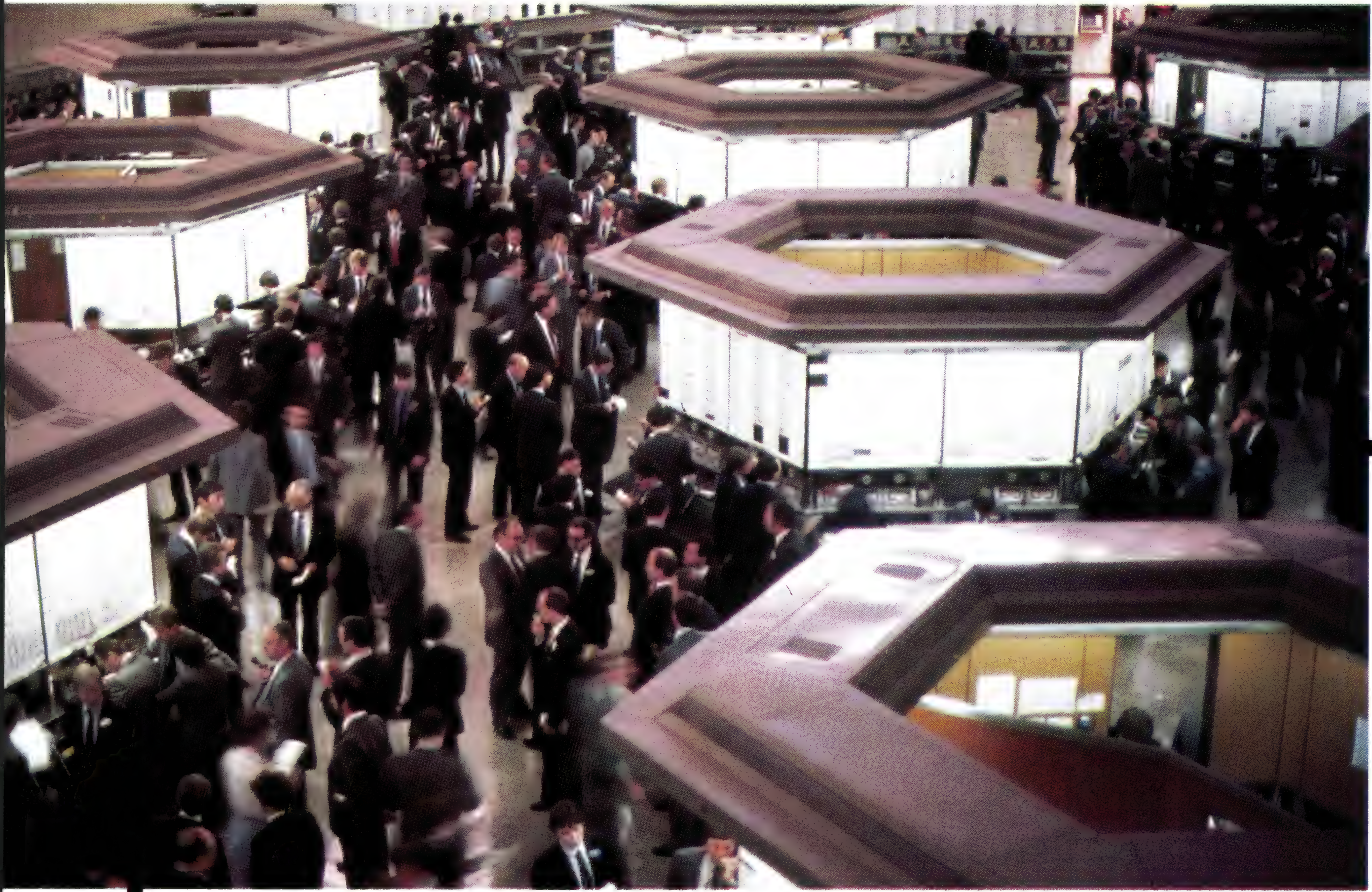
However, the cost structure and coverage range of mobile data is about to change quite radically. A while ago, IBM invented a packetised mobile data system which can use the existing cellular telephone infrastructure — and if this idea works even half as well as they say it does, then Mobitex and private packet radio may be facing extinction.

The CDPD Revolution

Cellular Digital Packet Data — CDPD — is the new acronym for you to absorb. It is now being developed by a consortium of American cellular operators and computer companies, with IBM, Apple and AT&T in the thick of it, since they can see applications with radio links to the new PDAs and laptop computers.

The technology appears to have evolved out of a protocol developed by IBM, called CelluPlan II, which is now running trials in the States at data-rates of 19.2Kbps. I am not certain of the CelluPlan/CDPD connection — I couldn't find anyone to confirm of deny the links — but CDPD appears to be the consortia's extensions of IBM's original idea. It also runs at 19.2Kbps.

They are not targeting just simple laptop to home-office communications, or base-to-truck fleet. 'We are talking about a total transformation in the way Americans view cellular services,' says Dennis Strigl, CEO of Bell Atlantic Mobile, with admirable Yank understatement.



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'Instead of wondering when the next bus is due, riders can see an electronic display at their bus-stop telling them how soon the bus will come, and how many seats are available,' he says. 'Truck drivers can learn immediately of delivery route changes, and salesmen will get up-to-the-minute quotes on inventory and pricing.'

A Bell Atlantic/AT&T handout also lists traffic lights, utility meters, alarm systems and vending machines as potential users of cellular data links.

Other projected applications include the transmission of credit card transactions from a 'card-swipe' so that pizza delivery can be paid-for at the front-door; electronic-mail and EDI from mobile offices; electronic bus tickets which calculate the length of a trip and make the deduction instantly; and information-on-demand for salesmen, service technicians and the police. The new PDAs from Apple, Sharp, IBM, AT&T and others will also use these wireless packet channels.

There's probably more than a little truth to these claims. The idea of integrating phone, fax, e-mail and personal computing on the one network is possible now because the radio bandwidth, data-rate and cell-structure to service the potential millions of customers (and machines) at a price they might be able to afford is now available.

Currently data transmission only represents 3% of cellular traffic in America, but with CDPD the carriers anticipate it rising substantially over the next few years — some estimates put it as high as 40% of all mobile traffic in 10 years, but this figure seems a bit extreme given the short duration of most messages — although, I guess that level is possible if you are exchanging data with all those cigarette machines and Coca-Cola dispensers.

The promised data protocols for the standard digital TDMA cellular systems have now only been promised, at the earliest, by mid-1995. With CDPD this feature of digital mobile telephony may not now be important; it is easier to by-pass the phone links by providing a parallel data-packet network and service, using the same air-interface, but in a completely independent way. And it works just as well on analogue AMPS and CDMA.

CDPD is to be an overlay network with its own location registers and switching centres, and it will send its data to either analogue or digital cellular base stations. At the base station it has a 'blitzer' switch on each channel which watches for gaps in the voice traffic, and the data network then just re-uses the available transmitters and channels in momentary 'slack-times.'

For the outbound path, CDPD depends on buffering packetised data at the base station, and transmitting it on channels which are temporarily not being used. In the early stages it will be just stealing channel bandwidth while calls are being established or broken down. With a bit more development they believe they may be able to grab 'silent' bandwidth from voice conversations when one party is listening — a variation on the DCME technology used in submarine cables.

I can't see this as being desirable in GSM, since the designers have gone to great efforts to switch off the mobile transmitter whenever it isn't carrying speech (called DSI — Digital Speech Inhibition/Interpolation) to reduce the interference load on the network — so I can't see them wanting to use this 'vacant' time for packetised data. However, currently the CDPD designers are much more interested in adding their system to the AMPS analogue network, and here the reuse of the silent conversation channel may well be possible.

Given the few seconds wasted each time a call is set-up and torn-down in a cellular system, and assuming that the usual speech-interpolation ratio of about 2:1 (available 'silence'-to-channel usage) of a normal voice conversation is possible, this would make available about 75% of the current cellular bandwidth for data — and they would get this without erecting a single new antenna, buying a transmitter, or paying the SMA for a spectrum licence.

This side of the data-mobile system would all come free; and coverage of the metropolitan areas would be able to be achieved cheaply and quickly.

Bell Atlantic is to be the first carrier off the mark. It intends to deploy the service in its six cellular regions (virtually nationwide) by the end of 1994, beginning with a trial service in Washington, D.C. in November 1993. Initially 30 cell-sites in the capital will be equipped with CDPD technology supplied by AT&T: Retix and Steinbrecher are also involved on the network-supply end.

McCaw has already started in Las Vegas and hopes to have 50% of its 105 site national network rolled out by mid-1994. Pacific Communications Science/Cirrus Logic has contracted Canadian Isotel Research to provide software which will 'support interoperability with the North American Cellular Network and TCP/IP Data Networks,' two of the most pervasive networking systems in the US. Cirrus, you may note, is one of the licensees for Apple's Newton technology, and is supposedly working with Apple on the radio links.

Stewart Fist is a freelance journalist based in Lindfield (NSW).

In the October edition of

AUSTRALIAN communications

ISDN CPE SURVEY
After four years in operation in Australia, ISDN still seems to lack the applications and customer premises equipment necessary for the technology to fulfill its promise. But this may be changing — next month we examine the second wave of ISDN CPE.

FDDI BRIDGES AND ROUTERS
As LAN capacity begins to run out, network managers are turning a more attentive gaze toward FDDI and its 100Mbps bandwidth. Next month we examine two of the most critical links in the high speed FDDI chain — FDDI bridges and routers.

APPLE NETWORKING
The networking industry loves big numbers, but higher speeds are not the only way to get more out of networking. Next month we take a look at Apple's Open Collaboration Environment, a set of APIs and other software which lets applications communicate.

HIGH SPEED WANS
Users have waited patiently for the arrival of high speed WAN services for years, but now that high speed WANs are becoming a reality in many parts of the world the new problem of how to manage them is arising. Next month we take a look at the issues.

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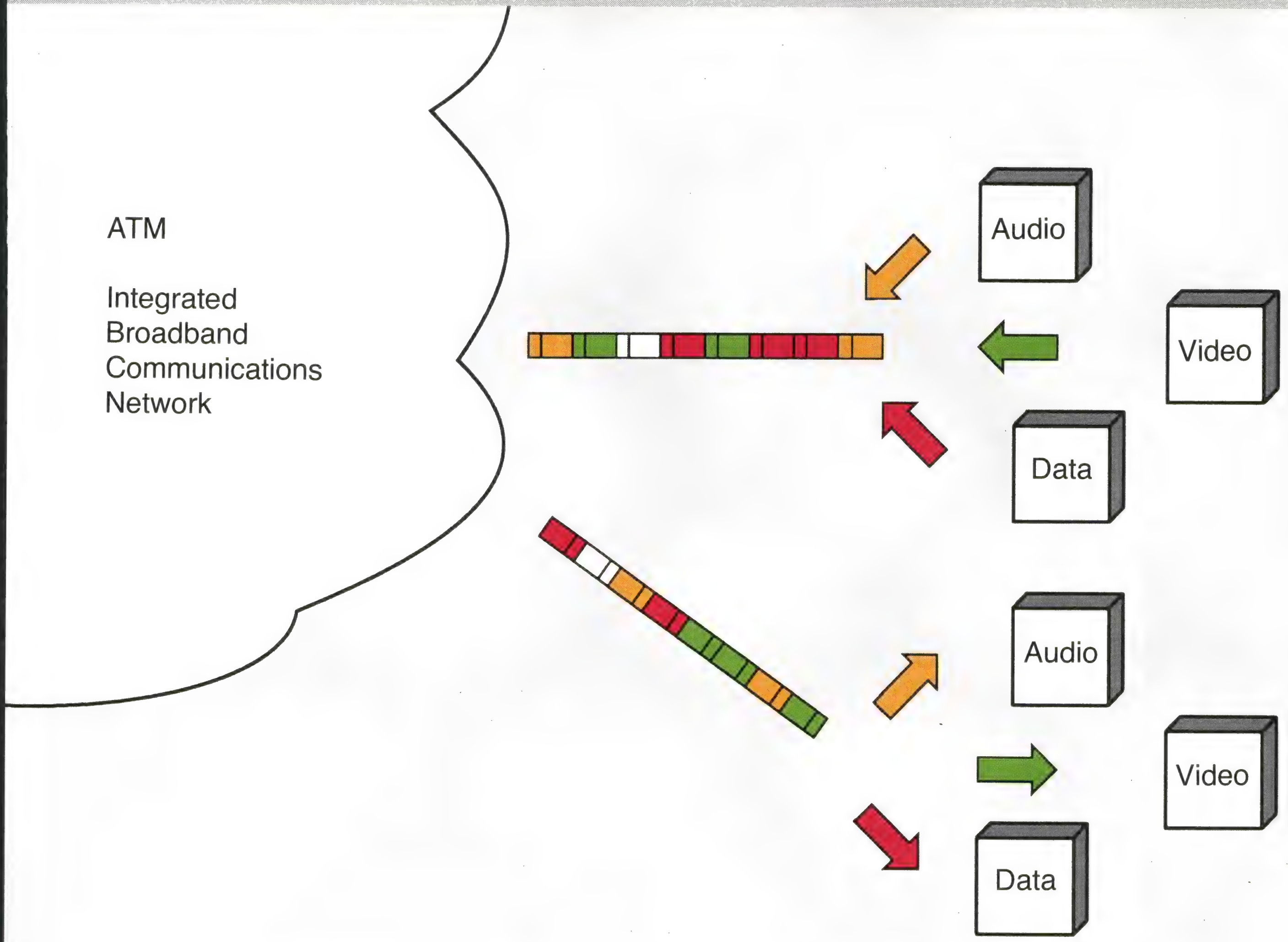

User demands on digital networks are expanding at an unprecedented pace for services such as data, speech, text, video conferencing and high resolution TV. This requires a single integrated multi-purpose network with transmission rates exceeding 100 Mbit/s.

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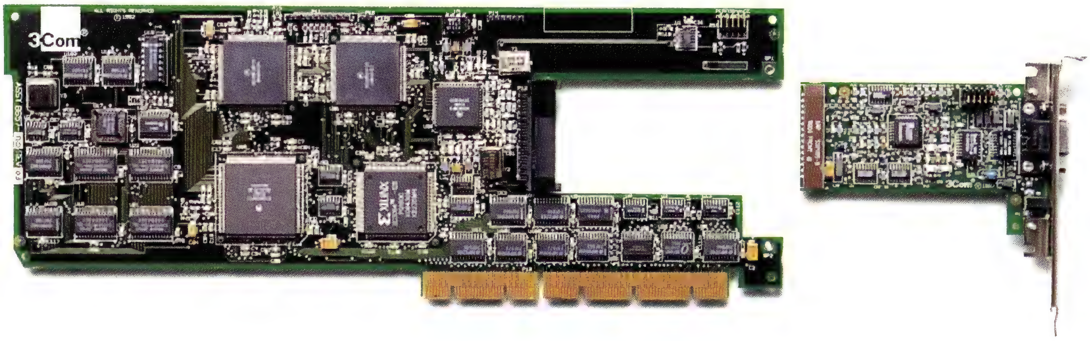

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Benson Rosen
and Brett Fromme

Smashing the SNA Internetworking Language Barrier

For SNA internetworking to realise its potential, users and vendors need an integrated taxonomy. The first step is understanding the technology issues for integrating SNA and TCP/IP backbones.

The great unification of corporate networks is underway. Users and vendors are fusing two separate and distinct backbones: SNA networks and TCP/IP-based internetworks. The technology barriers that must be overcome to integrate SNA and internetworks are considerable. So are the language barriers.

The language gap isn't surprising, given the fact that SNA and TCP/IP internetworking have evolved on their own terms. Ironically, integration efforts are adding to the problem in some respects. TCP/IP developers and SNA developers are approaching the task independently, and they are using different terminology to describe the intersection of SNA and internetworking. The jargon that has sprung from the SNA internetworking movement includes terms like SDLC tunnelling, proxy polling, LLC spoofing, directed explorers, datalink switching, and TCP/IP encapsulation. Some of these terms overlap; others are virtually redundant. As a group, they are undeniably confusing.

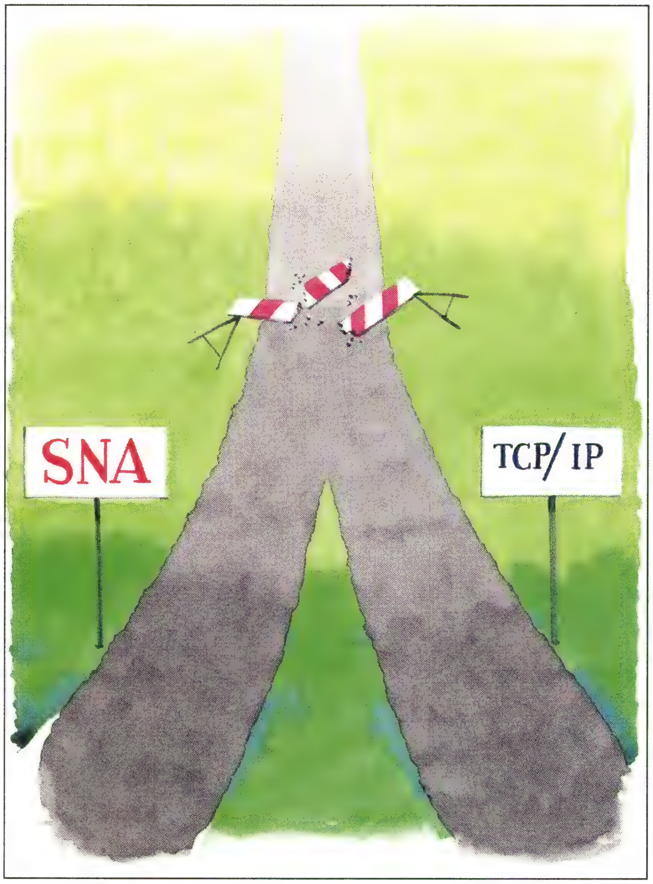
For SNA internetworking to realise its great potential, users and vendors on both sides eventually will have to develop an integrated taxonomy to go along with their integrated networks. The first step to toppling the language barrier is to understand the technology issues that underlie efforts to integrate SNA and TCP/IP backbones.

Two Approaches, One Goal

There are two basic approaches for interconnecting SNA and LAN traffic over a single internetwork. One involves the use of TCP/IP to create what can be called SNA/IP internetworks; the other is based on APPN (Advanced Peer-to-Peer Networking), a proprietary architecture from IBM.

At the centre of the TCP/IP strategy are multiprotocol routers that use router-to-router protocols like RIP (routing information protocol) and OSPF (open shortest path first) as their critical backbone technologies. These routers evolved out of TCP/IP and Ethernet environments; as LANs expanded, the routers were enhanced to accommodate more protocols and to provide critical segmentation capabilities. The latter enabled IP routers to become the key to controlling broadcast storms and ensuring reliability in large meshed internet backbones connecting local and remote LAN users.

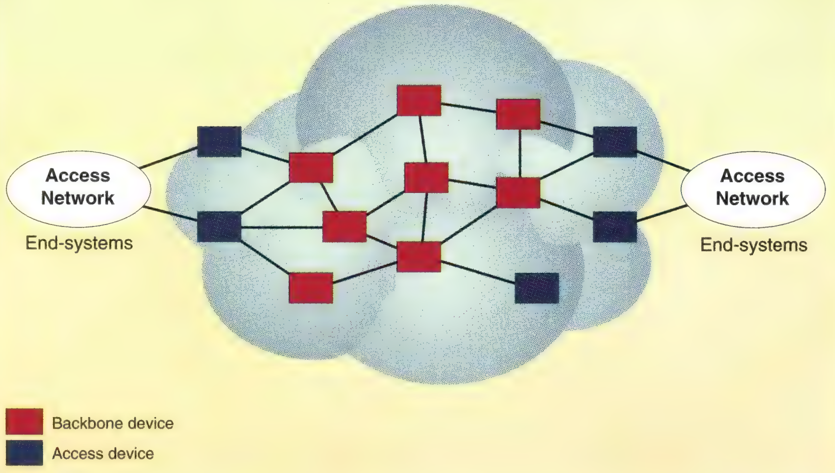
The next logical step was to equip IP routers to handle the major protocols in the IBM SNA world, such as SNA/SDLC (synchronous data link control), SNA/Token Ring, and NetBIOS. To accommodate conventional 3270 terminal traffic, router vendors added features like protocol encapsulation and conversion. Meanwhile, the makers of Token Ring bridges began to introduce router-like features into their products. These twin developments have served as the springboard for the SNA/IP internetworking movement.



On the SNA side is APPN, IBM's extension of hierarchical terminal-to-host SNA networks. As well as conveying 3270 terminal traffic, APPN networks handle peer communications among hosts, departmental computers, and desktop machines. Because APPN is based on the protocol formats of SNA, it can convey peer-to-peer and terminal traffic with little or no encapsulation or conversion.

Figure 1: Separate Spheres of Networking

The key to carrying SNA and IP traffic over the same internetwork is to put up a firewall of access routers that connect the local (access) networks and the backbone WAN. The access routers encapsulate or convert traffic for sending over the wide area.



When APPN is complete, IBM will have an architecture that offers enterprise-wide connections for host-dependent and peer-to-peer traffic. Over the past few years, IBM has been building APPN support into Network Nodes, which include routers, front-end processors (FEPs), and controllers. But several APPN pieces still are not in place, while SNA/IP internetwork alternatives — including one from IBM — are available now. APPN also has to be installed on mainframes and other major End Nodes, while SNA/IP is transparent to SNA End Nodes.

Although SNA/IP and APPN are fully independent enterprise architectures, there is no reason that they can't co-exist on the same physical network. In fact, several router vendors have already committed to developing products that handle both IP and APPN simultaneously. It's possible that in the future some enterprises will deploy pure APPN or IP backbones, but more organisations probably will have both.

The primary distinction between SNA/IP and APPN architectures is the backbone protocol used. Both have the ability to transport a wide range of protocols, including NetBIOS, TCP/IP, and Novell NetWare's IPX/SPX. Standards for conveying APPN End Node traffic over IP backbones, such as the new Advanced Peer-to-Peer Internetworking (APPI) spec backed by a host of router vendors, are now in development.

IBM's very own Multi-Protocol Transport Networking (MPTN) model lets any end-node protocol run over any transport protocol, including TCP/IP over APPN, and vice versa. In fact, IBM already has recently demonstrated APPN networks that can transport traffic from Unix Sockets applications, which typically exist only in pure IP environments.

An Architectural Framework

Whether it is based on APPN or SNA/IP, an enterprise-wide SNA internetwork has two main spheres of operation: the access network and the backbone network (see Figure 1). The access network is the realm of the end-user; it includes LAN and SNA computing devices like PCs, workstations, terminals, hosts, SDLC communications controllers, and file servers. The backbone network is the wide area infrastructure that interconnects access networks across a campus, region, country, or across the globe. In SNA internetworks, access networks are linked to the backbone by access devices — typically routers or SNA communications processors. Access devices provide a firewall between traffic-intensive access networks and the bandwidth-constrained wide area network.

Understanding the interaction between access and backbone devices in APPN and IP internetworks is key to sorting out the myriad details of encapsulation, spoofing, termination, remote polling, and the like. In APPN networks, access devices perform APPN Network Node functions. These devices can be routers, FEPs, or LAN-attached communications controllers. APPN Network Nodes provide enterprise directory and topology services. They also serve as points of concentration between APPN End Nodes on access networks and the APPN Network Nodes on the backbone. (For a detailed look at APPN architecture, see 'APPN Rises to the Enterprise Challenge,' *Australian Communications*, June 1993.)

In SNA/IP internetworks, the access and backbone functions place very different demands on routers. Routers used as SNA/IP access routers, sometimes known as edge or boundary routers, connect directly to SNA and internetwork devices via a local SDLC or LAN link. Access routers concentrate network traffic from their attached access network, encapsulate SNA and NetBIOS traffic in IP packets, and protect routers in the backbone network from the effects of bandwidth-inefficient LAN protocol traffic.

SNA/IP access routers make use of protocol spoofing, encapsulation, and conversion to compensate for the wide area inefficiencies of native end-system protocols, particularly NetBIOS, SDLC, and Logical Link Control (LLC), the sequencing and error-control protocol used at the data link layer of Token Ring LANs.

In complex topologies with many hops, SNA/IP access routers typically encapsulate SNA and NetBIOS traffic in network-layer IP packets. Alternatively, this traffic can be encapsulated using a simple data link layer framing, such as 802.X or high-level data link control (HDLC), to lower packet overhead on WAN links. However, data link bridging of SNA traffic is suitable only for simple networks with relatively few hops. For medium and large networks with complex mesh configurations, SNA/IP internetworks must be based on multiprotocol routers with strong IP support.

Once an SNA/IP access router has concentrated traffic from access network devices, backbone routers are then responsible for delivering this traffic via WAN or metropolitan area network (MAN) links to all points in the enterprise network. Backbone routers use protocols like OSPF and OSI's intermediate system to intermediate system (IS-IS) to create a reliable, deterministic enterprise infrastructure.

Vendors use different schemes to encapsulate access protocol traffic in IP, and also use a variety of different terms to describe those schemes. The terms 'proxy explorers,' 'directed explorers,' 'RIF (routing information field) caching,' 'MAC (media access control) caching,' and 'data link switching' all refer to some type of IP encapsulation. Although these techniques can differ considerably, they all allow IP routers to locate Token Ring stations without excessive broadcasting, and they all provide a reliable routed topology.

Source Routing Over IP

The first, most basic, and perhaps still most ubiquitous method of linking SNA terminal traffic and LANs over internetworks is to put Token Ring LAN adaptors into SNA devices like communications controllers and FEPs, making those devices functioning participants in Token Ring LANs. Existing Token Ring bridges can then use LLC sessions running over standard IEEE 802.5 Token Ring links to forward traffic from Token Rings and 3270 terminals.

As more FEPs, controllers, and PCs are attached to Token Rings, local area network topologies can be extended with local and remote source routing bridges. Connections between remote bridges typically are made over medium-speed links, such as 19.2Kbps or 48Kbps; in some cases, higher speed links are used.

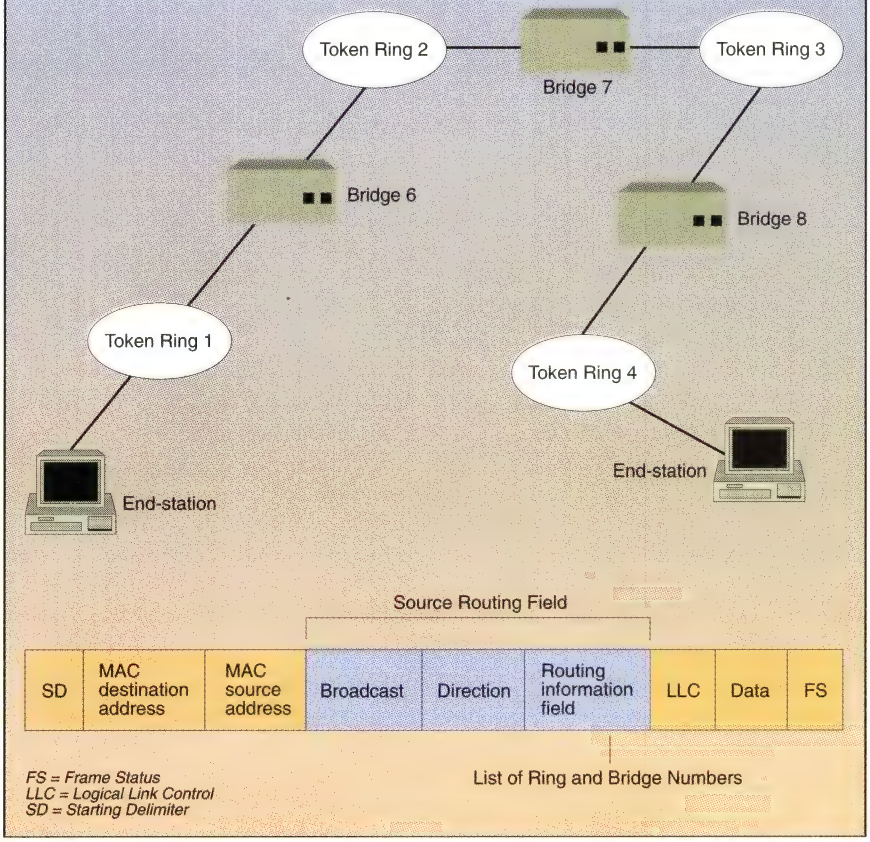
Bridged Token Ring networks can pass SNA, NetBIOS, IPX/SPX, and other types of client-server traffic. As these networks expand, however, the primary limitations of bridging — especially limited hop counts and excessive broadcasting — become glaringly apparent.

As the dominant protocol for moving network traffic between local and remote Token Rings, IBM's Source Route Bridging (SRB) is used extensively for FEP-to-FEP, FEP-to-controller, and NetBIOS client-server links. Under IBM's original SRB product, two local or remote Token Rings are bridged by a PC installed with IBM's Token Ring Network Bridge Program.

As defined by the IEEE 802.5 standard, Token Ring frames contain fields for source and destination addresses, start and end delimiters, and frame check sequence. To support SRB, Token Ring frames are enhanced with several optional source routing fields (see Figure 2). The most important of these is the RIF, the function of which is to tell source routing bridges what path a frame should take through the network. When a Token Ring is initially configured, numbers are assigned to each ring and bridge. The RIF is a list of consecutive ring and bridge numbers that define a path through the topology. SRB limits the number of RIF bridge hops to seven.

Figure 2: A Look at Source Route Bridging

Under source routing, Token Ring frames include additional source routing fields. The most important of these is RIF, which tells source routing bridges which paths a frame should take through the network.



Router vendors incorporating bridging capabilities into their products have gone far beyond IBM's original two-port bridges to provide dozens of SRB-capable ports. When router ports are configured for SRB they bridge — not route — native SRB traffic. These same ports also can be configured to encapsulate SRB traffic in routed IP, extending SRB beyond its seven-hop limit and drastically reducing or eliminating broadcast messages.

IP encapsulation allows SRB traffic to be routed with Layer 3 and 4 intelligence across the SNA/IP backbone, confining native SRB to access networks. To provide reliable transport for SRB traffic through the backbone, access routers can run TCP software on top of IP. TCP provides sequencing, flow control, and error recovery for encapsulated SNA traffic, but it also adds around 20 bytes to each packet. For less overhead, the user datagram protocol (UDP) or a form of minimally sequenced IP (a small sequence number added to each IP packet for error recovery) can be deployed.

To overcome the seven-hop limit imposed by SRB, SNA/IP access routers manipulate the RIF to allow more hops. This 'enhanced' or 'extended' SRB typically is accomplished by making the SNA/IP backbone appear as a single virtual ring to nodes on SRB access networks. With extended SRB, a frame can take several hops in each access network and many hops in the backbone. The backbone hops appear as a single virtual hop to the SRB protocol and count as only one hop in the RIF. The other six hops can be used on either or both access networks.

Broadcast Busting

Under SRB, end-stations that need to establish a session find their intended receiving stations by broadcasting 'explorer' frames (also called discovery frames, test frames, or probes) that are addressed to the target MAC address. In SRB's route discovery process, explorer frames are propagated by bridges throughout the enterprise to every local and remote ring. As explorer frames traverse the network, any bridge that receives a frame adds its ring/bridge numbers to the frame's RIF. Eventually, one of the broadcast frames finds its way to the target station, which then sends back a non-broadcast response frame to the source by using the new RIF, reversing the order in the field.

When this response frame gets back to the source station, the RIF information is recorded and used for subsequent frames in the session. Once traffic starts flowing back and forth, bridges know which direction a frame is headed by the SRM direction bit.

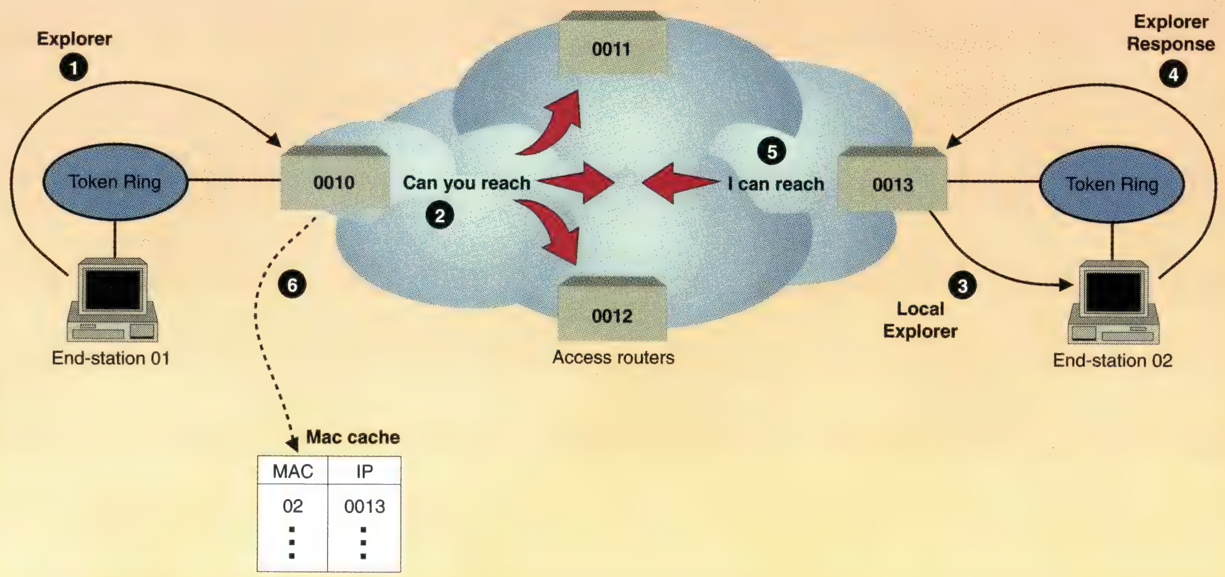
In large networks with complex configurations, the propagation of explorer packets under SRB can quickly clog low-speed WAN lines. SNA/IP internetworks reduce or eliminate SRB broadcasts through IP encapsulation and by assisting in the location of SRB end-stations.

One IP encapsulation approach allows routers to be configured to forward SRB explorer frames to certain access networks only. Under this scheme, which sometimes is called the directed explorers approach, network administrators manually enter the access network or MAC addresses of heavily used nodes (such as servers or FEPs) into access router tables. This kind of approach works particularly well in networks that have clearly defined traffic patterns.

Under a second approach, known as RIF caching or the proxy explorer approach, routers store in cache memory a copy of all RIFs that pass through them, as well as the MAC addresses stored in cache, it then returns the cached RIF information to the explorer's source, locally terminating the broadcast process. If the router doesn't have the MAC address in cache, it floods the

Figure 3: Six Steps to MAC Address Caching

IBM's Data Link Switching uses a six-step approach in building MAC address caches in each networked router. When an end-station sends an explorer to find a session partner (1), its access router sends a Can You Reach message to all other access routers (2). Those routers then send explorer packets to their attached end-stations (3). The appropriate end-station then sends a response to its access router (4), which in turn sends an I Can Reach message to the originating router (5). The two routers then record the MAC addresses of the sending and receiving stations in their address cache (6).



explorer packet via IP encapsulation to other routers over the backbone. When the response frame passes back through the router, the router then caches the MAC address and returning RIF for future use.

A third method of broadcast control, called MAC address caching, automatically caches MAC-to-IP address mappings for individual Token Ring devices throughout the enterprise. Automatic MAC caching is a feature that originated in IBM's Data Link Switching (DLS), a published IP encapsulation specification that conveys SNA, LAN, and SDLC traffic across an IP internetwork. IP router vendors are now working to make DLS an industry standard.

To build MAC-to-IP address tables in access routers, DLS uses a protocol known as Can You Reach/I Can Reach (see Figure 3). MAC address caching under DLS begins when an access router receives an explorer packet from a local end-station that wants to establish a session with another end-station. When it receives the explorer packet, the access router then sends a 'Can You Reach' request via IP to other access routers in the network. These routers then broadcast to their access networks explorer frames with the destination station's MAC address.

When the router attached to the intended receiving end-station receives a response frame from that station, it sends an 'I Can Reach' message back to the originating access router. When the originating router receives that message, it automatically builds a table entry that maps the destination MAC address to the IP address of its access router. The access router at the receiving end also builds a table entry for the originating end-station and router. To complete the process, the originating access router creates and sends to the originating end-station an SRB local explorer response frame that contains a RIF field describing the local path between the end-station and its access router. (This is done because access networks can have multihop SRB topologies).

From this point on, the router can respond to any explorers looking for the receiving end-station without broadcasting. Every time another end-system sends an explorer, DLS automatically creates a new MAC/IP address entry. But before a router will use its cache, it sends the destination router a directed (non-broadcast) Can You Reach message to verify that the destination end-station still exists. DLS minimises broadcasts, conserving bandwidth. It also extends SRB's maximum hop count by resetting the RIF for either access network, so each access network involved in a session can have up to seven hops, instead of the maximum six hops for both access networks.

LLC Realities

SNA network protocols were built to run over a connection-oriented data link layer that provides end-to-end sequencing, packing and error control. In SNA environments, this service is furnished by SDLC, whereas LAN environments use 802.2 LLC type 2. LLC is an end-to-end, nonroutable protocol, but it does provide sequencing of MAC layer frames, error correction, and flow control between end-stations.

Due to its wide deployment on FEPs, controllers, and NetBIOS client-server stations, LLC is a significant factor in SNA/IP internetworking. SNA and NetBIOS devices need LLC connection-oriented circuits because they don't get routing, sequencing, or error control in bridged Token Ring environments. Because LLC was developed for tightly coupled sessions across LANs, several of its characteristics can become problems when LLC is pressed into service in large, complex internetworks.

One problem associated with running LLC over larger networks is broadcast overhead. To establish an LLC session, end-stations broadcast test frames to locate partners. On Token Ring networks LLC uses the SRB route discovery service; test frames are SRB explorers containing the LLC test command. The broadcast management strategies for IP encapsulation methods can also be used to control LLC test frame propagation, solving the broadcast problem.

To address other LLC issues — excessive acknowledgments, keep-alive messages for idle sessions, timer expirations, and LAN/WAN congestion control — SNA/IP

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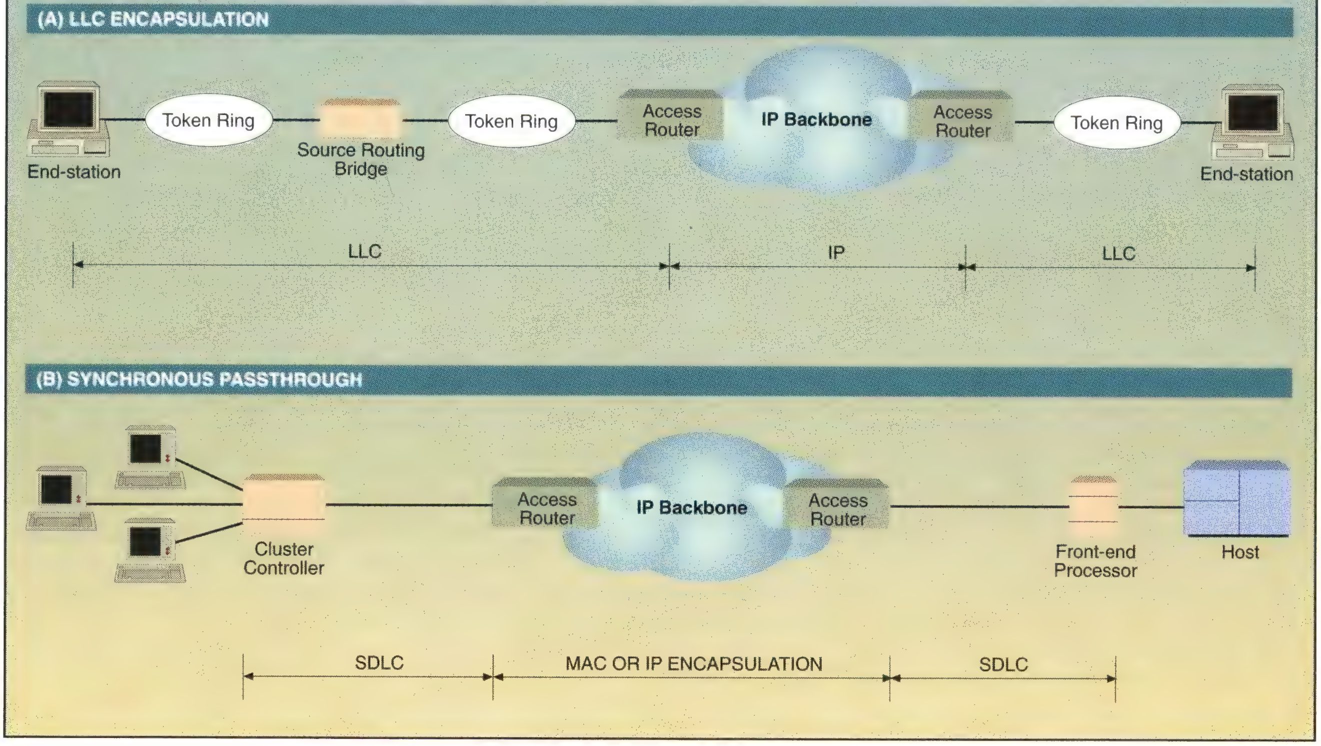
Figure 4: Encapsulating LLC and SDLC Traffic

With LLC encapsulation (A), access routers suppress LLC supervisory commands to prevent them from being sent over the wide area. The routers then are responsible for maintaining LLC sessions at either end of the WAN. With SDLC passthrough (B), SDLC traffic is encapsulated in IP or a MAC-layer protocol for sending over the WAN.



divides each end-to-end LLC circuit into two localised segments that are separated by an IP delivery route (see Figure 4A). As far as the LLC end-stations are concerned, an end-to-end LLC Type 2 circuit still exists, but in reality the LLC functionality is kept within the access networks. This approach is known as LLC termination.

LLC does not create the constant polling traffic that typifies SDLC links. But LLC is an acknowledgment-intensive protocol that generates acknowledgments that are redundant with those of higher-level protocols.

LLC supervisory frames are referred to by the LLC commands they convey: Receiver Ready (RR), Receiver Not Ready (RNR), and Reject (REJ). RRs are used for acknowledgment, while RNR frames tell the sending end-station to stop sending. REJ frames tell the sender that a frame was bad or not properly received.

Even when there is no data flowing, LLC stations send RR frames back and forth periodically to keep idle sessions alive. During idle periods, LLC stations run inactivity timers (IBM calls them Ti timers); when an end-station's inactivity timer expires, it sends its session partner station an RR frame to keep the session alive and then waits for a response frame. The typical default for inactivity timers is 30 seconds.

On a LAN, RR acknowledgments and keep-alives do not threaten network performance. But in larger bridged architectures with hundreds or thousands of stations and low-bandwidth WAN links, RRs can be trouble. The solution to this problem is to keep LLC supervisory frames localised on access networks. To accomplish this, SNA/IP access routers create the appearance of a local LLC link station that generates LLC supervisory frames. By acknowledging the frames locally, routers take on the responsibility of guaranteeing delivery via TCP or a similar reliable protocol. Once data starts flowing, frames sent by LLC end-stations are acknowledged individually or in groups by the local access router. Keep-alives are exchanged locally as well. With the LLC termination approach, excessive supervisory frames do not affect the SNA/IP backbone and its WAN links.

Taming Timers

As internetworks grow and end-to-end transmit times increase, LLC's expiration timer can become troublesome. Response timers — referred to as T1 timers — are independent from Ti timers. Each time an LLC station sends a frame that requires an acknowledgment, it starts an internal T1 timer and expects an acknowledgment back within the timer's period. Because LLC is a LAN protocol, its timer limit is short — usually about 1 second. Most network devices allow managers to adjust response timers, but communications controllers have 1-to 2-second timer values that often cannot be adjusted.

If an LLC station sends a frame and does not receive an acknowledgment within the response timer limit, it enters a recovery condition and periodically sends its session partner supervisory RR frames until it receives a response or until its maximum retry count is reached. After the maximum allowable number of retries, the session is considered lost and the connection is broken.

By maintaining response timers in local access routers — a process known as terminating LLC timers — IP encapsulation methods can acknowledge LLC frames well within the required period. This eliminates the need to adjust timers in large numbers of end-stations.

When LLC sessions are kept off the backbone network, a sophisticated two-stage LAN/WAN congestion control technique becomes possible. Routers in the backbone network can use TCP congestion control, while access routers use LLC congestion control in the access networks. Although TCP usually is found on end-stations, it can be deployed in pairs of access routers to provide congestion control and sequenced, error-free transport.

To control congestion on access networks, access routers send RNR supervisory frames to LLC end-stations to stop

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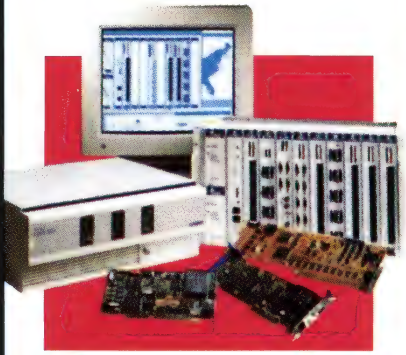

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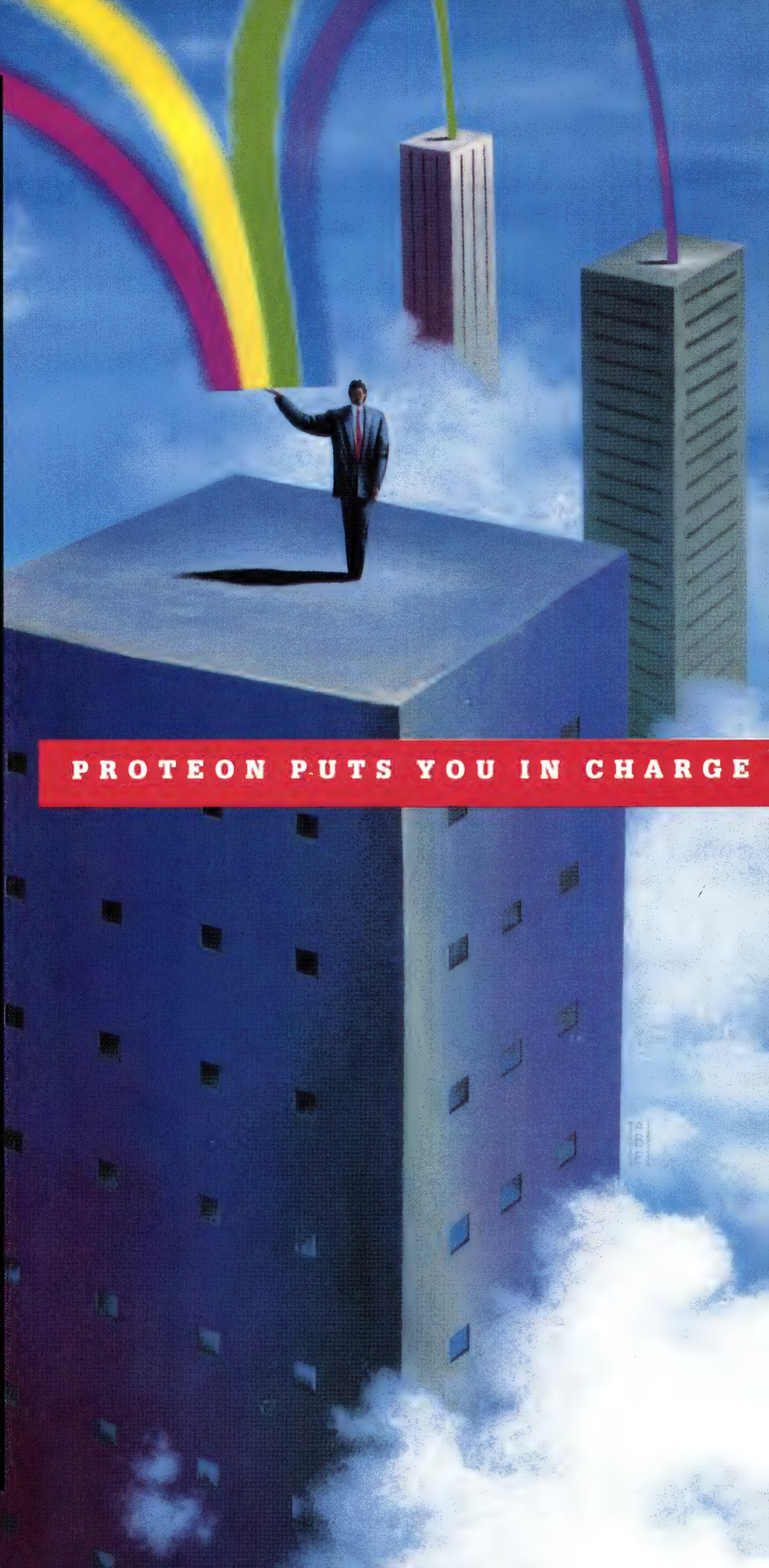
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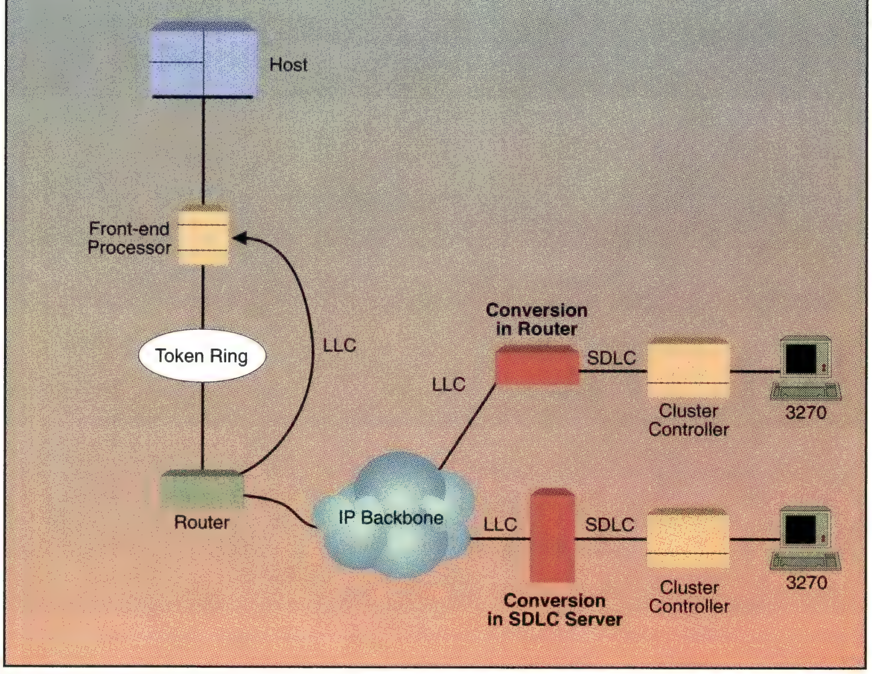
Figure 5: The Conversion Approach to SDLC

With SDLC conversion, routers or servers attached to SDLC devices like cluster controllers convert traffic to the LLC format. Devices that can handle LLC, such as front-end processors equipped with Token Ring cards, can then process data using higher-speed links. Converted data is sent over the WAN using LLC bridging or encapsulation.



traffic temporarily. To control congestion in the backbone, routers use TCP's sliding-windows flow control. On a given end-to-end path, the SNA/IP routers can translate LLC pacing commands into TCP pacing, and vice versa.

This kind of integrated LAN/WAN congestion control offers a number of benefits. For example, a receiving end-station can send an RNR frame to its local access router to halt incoming traffic. The access router in turn uses TCP to limit the flow from a router on the other side of the SNA/IP network. The partner access router then uses an RNR frame to throttle traffic from the sending end-station.

SDLC Internetworking

In addition to handling problems that stem from bridging remote LANs, SNA/IP internetworks must deal with problems related to SDLC, IBM's protocol for SNA terminal traffic. Despite efforts to run SNA traffic over Token Ring, most SNA networks must continue to support minis, FEPs, and other communications controllers with SDLC interfaces, making SDLC an almost universal requirement for SNA/IP internetworks.

SNA/IP internetworks can accommodate SDLC by replacing a portion of the end-to-end SDLC path with an internetwork topology. Ideally, this process maintains the appearance of native end-to-end SDLC to FEPs and other devices.

There are two primary methods of folding SDLC traffic into the SNA/IP internetwork: SDLC passthrough and SDLC-to-SDLC conversion. The more straightforward approach is SDLC passthrough, also known as SDLC transport or synchronous passthrough. SDLC passthrough is a form of protocol tunnelling in which SDLC traffic is encapsulated in an internetwork protocol for transport across the backbone. Some routers use a MAC-layer protocol for encapsulation, while others use IP (see Figure 4B).

To deploy SDLC passthrough, SDLC devices are connected to a serial port on their respective access routers. When traffic flows from one device to another, SDLC frames are encapsulated by the sending device's access router and bridged or routed across the backbone. With MAC-layer bridging or IP routing, the backbone provides automatic selection of the best path and dynamic recovery in the event of intermediate link failures. Once traffic makes it through the backbone, the access router at the receiving end strips off the MAC or IP header and trailer and passes the unmodified SDLC frame to the receiving device.

When access routers use MAC-layer framing, SDLC passthrough has little encapsulation overhead (minimal addressing headers and frame-check fields), making efficient use of WAN links. But delay increases proportionally to the number of hops in the network. If the backbone portion of an SDLC path has many hops, an IP encapsulation may make more sense than MAC-layer framing. The trade-off is overhead — IP adds about 20 bytes of header information to each frame. In some implementations, however, SDLC passthrough passes all SDLC polls and poll responses end-to-end. This constant stream of control frames can put a heavy load on the SNA/IP backbone. The solution is to convert SDLC traffic to LLC.

SDLC-to-LLC conversion — also called SDLC conversion, SDLC translation, or synchronous data via LLC — is often used in cases where FEPs have Token Ring (or Ethernet) connections and communications controllers have SDLC interfaces. Like SDLC passthrough, SDLC conversion preserves the SDLC interface on controllers or other SDLC devices. But from the FEP's perspective, SDLC conversion makes SDLC devices look as if they are attached to a LAN (see Figure 5).

SDLC conversion offers many benefits, including the replacement of multiple low-speed SDLC lines with a higher-speed internetwork link. The requirement for FEP ports is also reduced because an FEP Token Ring interface can concentrate traffic for many more SDLC devices than a FEP SDLC interface can. In many cases, remote FEPs can be eliminated altogether because downstream controller traffic is concentrated by internetworking equipment.

In one conversion approach, a dedicated device called an SDLC server connects directly to the communications controller to convert SDLC traffic to LLC. The SDLC server in turn uses Token Ring or Ethernet to connect with an SNA/IP access router. A high-end SDLC server can provide more than a dozen SDLC ports. In another approach, conversion takes place in the access router. This eliminates the need for a separate SDLC server, but can tax the processing power of the router and introduce a performance liability.

Whether it takes place in a server or an access router, LLC conversion involves stripping off SDLC headers and trailers from host-bound frames and adding LLC and Token Ring (or Ethernet) formatting. After conversion, the LLC frames are bridged or routed through the SNA/IP backbone to a LAN-attached FEP or similar target device. The SDLC conversion device can directly poll its locally attached controllers, eliminating the substantial overhead of end-to-end polling. This polling technique is often called poll spoofing because the SDLC conversion devices at both ends of the path must fool the FEPs and controllers into thinking that end-to-end polling is taking place. Some vendors call this technique remote polling. Once SDLC is converted to LLC, it can be transported through the backbone with the IP encapsulation (or bridging) methods described earlier.

Benson Rosen is director of professional services, and Brett Fromme senior network consultant, for Wellfleet Communications.

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NetWare MultiProtocol Router

Novell has announced a new version of its NetWare MultiProtocol Router (MPR), which adds source route bridging of SNA and IBM NetBIOS protocols between Token Rings. Officials said the router allows users to build enterprise internetworks using just a PC and the MPR to perform routing, source-route bridging and multiport wide area connectivity.

Novell has also announced the MultiProtocol Router Plus 2.1, which adds WAN connectivity to the standard features of the MPR to provide a complete local and remote internetworking solution.

The MPR 2.1 has a number of important features. It is able to perform concurrent source-routing bridging and multiprotocol routing, allowing bridged protocols and routed protocols to share a common link. Token Ring connectivity has been improved, and up to six Token Rings can be directly connected to a single NetWare MPR, reducing the overall number of bridges.

The MPR 2.1 allows multiple Token Rings to be connected to a NetWare server, and handles both local and remote connectivity including support for Token Ring, Ethernet, LocalTalk, ARCnet, FDDI and other cards with ODI drivers, and for X.25 and synchronous links using the industry standard point-to- point protocol.

The MPR supports up to 16 WAN interfaces and six LAN interfaces in a bridged environment, and up to 16 WAN and 16 LAN interfaces in a routed environment. Novell officials said another benefit is that the MPR eliminates the cost of a separate WAN link by routing IPX, IP, AppleTalk and OSI traffic along with source-route bridging SNA traffic between remote Token Rings over a single communications link.

The MPR 2.1 supports MIB II and other protocol-related MIBs, and can be managed via SNMP-based management systems. Additionally, the source-route bridge will be manageable by LAN Network Manager, and the product takes advantage of many of NetWare's built-in security features, including encrypted password protection and remote management capabilities.

The MultiProtocol Router 2.1 requires an 80386 or better PC with 8MB RAM and 40MB hard disk. Token Ring cards from Novell, Madge, 3Com or IBM are required for source-route bridging.

Novell (02) 413 3077

Lotus cc:Mail 2.0

Lotus Development has introduced a new release of its best-selling electronic mail software, cc:Mail.

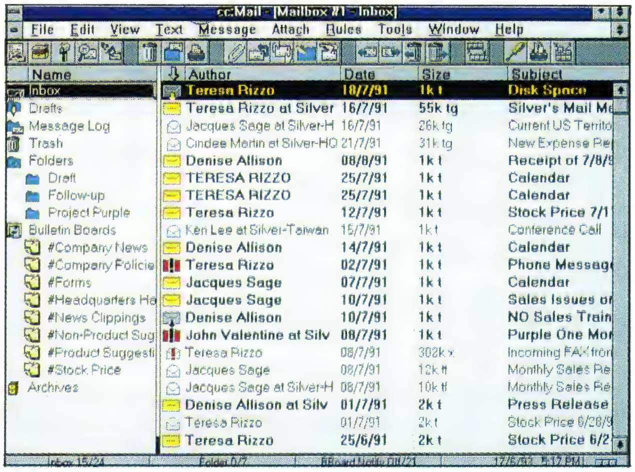
cc:Mail version 2.0 features a redesigned user interface, spell checking, user-'saveable' e-mail addresses, folders for draft and deleted messages, and powerful new rules and search capabilities, said an official from Lotus.

The new rules automate message handling by enabling users to instruct the mail system to perform tasks if certain events occur. The rules are dialogue-driven and feature easy-to-use pick lists, the official said.

The new search capability also provides better mail management functions, allowing system users to perform both simple searches and advanced 'free-form' searches with multiple 'and/or' conditions.

The new version also features a re-designed text editor, permitting users to import and export text without the use of the Windows clipboard, viewers for spreadsheet applications, the ability to find and replace text, and the ability to compress attached files with a user-selectable compression algorithm.

Lotus Development (02) 286 1800



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Teresa Rizzo at Silver	16/7/91	55k tg	Silver's Mail Me
Jacques Sage at Silver-H	16/7/91	26k tg	Current US Territo
Cindee Martin at Silver-HQ	21/7/91	31k tg	New Expense Re
Denise Allison	08/8/91	1k t	Receipt of 7/8/9
TERESA RIZZO	25/7/91	1k t	Calendar
TERESA RIZZO	25/7/91	1k t	Calendar
Teresa Rizzo	12/7/91	1k t	Stock Price 7/1
Ken Lee at Silver-Taiwan	15/7/91	1k t	Conference Call
Denise Allison	14/7/91	1k t	Calendar
Teresa Rizzo	02/7/91	1k t	Phone Messag
Jacques Sage	07/7/91	1k t	Calendar
Jacques Sage	10/7/91	1k t	Sales Issues o
Denise Allison	10/7/91	1k t	NO Sales Train
John Valentine at Silv	08/7/91	1k t	Purple One Mo
Teresa Rizzo	08/7/91	302k x	Incoming FAX fro
Jacques Sage	08/7/91	12k ff	Monthly Sales Re
Jacques Sage at Silver-H	08/7/91	10k ff	Monthly Sales Re
Denise Allison at Silv	01/7/91	2k t	Press Release
Teresa Rizzo	01/7/91	2k t	Stock Price 6/28/9
Teresa Rizzo	25/6/91	2k t	Stock Price 6/2

Lotus cc:Mail features a re-designed user interface

New U-B Token Ring Product Family

Ungermann-Bass has announced a new family of high-performance Token Ring products: the ASM420 Token Ring Concentrator, the Network Early Warning System, and the ASM-5530 Access/Plus Multiport Token Ring Bridge/Router.

The ASM provides Access/One customers with the largest number of ports per hub of any major intelligent hub vendor, according to Ungermann-Bass officials. It features 24 ports per concentrator (22 station ports plus ring-in and ring-out ports), and this high port density gives users a total capacity of up to 220 managed ports in a single Access/One. All 220 ports in up to 10 rings can be managed by a single supervisor module, said officials.

In addition, the ASM420 offers features such as Beacon Avoidance, which automatically tests ports trying to insert into the ring to ensure they are operating at the same speed as the ring, and Per-Port Retiming, which reduces jitter by retiming the Token Ring signal as it leaves each port.

The Network Early Warning System provides an advanced early warning system for the ASM420 concentrator. It allows users to set gauges and thresholds and be notified when levels exceed the predefined limits. Additional features include Critical Resource Monitoring, which notifies users if a critical resource becomes disconnected from the hub, and Intruder Guard, which sends an alarm to the network administrator if a device without a valid address connects to the port. Two daughter cards, the AMO410T/2 and AMO420T/2 provide features such as jitter elimination, and, according to the company, offer unparalleled support for 4 or 16Mbps Token Ring on unshielded twisted pair, while Automatic Fault Recovery constantly monitors the ring for beaconing.

The ASM5530 Bridge/Router features two Token Ring ports and one Ethernet connection on a single-slot module. It supports IEEE 802.5-89 and IBM Token Ring standards, and offers dual RISC processors for high performance bridging and routing, officials said. The ASM5530 utilises Ungermann-Bass' high-speed PlusBUS switching backplane for high performance hub-based internetworking. The PlusBUS enables high performance transfers between Token Ring ports on the ASM5530 and other RISC-based internetworking modules such as the ASM6361 FDDI Bridge/Router and the ASM5330 Multiport Ethernet Bridge Router, and is also used to communicate with the company's DragonSwitch Ethernet switching module.

Operational software resident in Flash EPROM provides plug-and-play operation, and the ASM5530 also features SNMP-based network management capability. It operates over either UTP or STP cabling, and features hot-swap capability that allows a user to insert or remove the board without shutting down the hub. It also supports Source Routing Bridging between Token Ring ports on the same board, or with Token Ring ports on another ASM5530 across the PlusBUS.

Ungermann-Bass (03) 696 2006

Easyreach for MicroChannel systems has built-in error detection

Easyreach for MicroChannel

Australian research and development firm, Stallion Technologies, has released a MicroChannel version of its Easyreach product, which provides distributed connectivity for a wide range of Unix-based MicroChannel systems.

Easyreach uses OSI protocols to communicate between the host adaptor, located in the Unix system, and concentrators, which are connected to the host adaptor via twisted pair cabling.

The protocols used include LAPB for the data link and X.21 for the physical connection, using X.27/RS-422-A signalling for long distance and high noise immunity. Company officials said this allows concentrators to be located up to 1,525 metres from the host system, or remotely in another building, campus or city.

The remote link is supported via an ISDN terminal adaptor, with transmission rates of up to T1 speeds, or via a Network Terminating Unit (CSU/DSU) over a leased line at speeds of 48Kbps or 56Kbps.

Officials said because Easyreach uses standard, compatible protocols the wide area link is transparent, and is more reliable. LAPB has built-in error detection (Frame Check Sequence) for each message frame, allowing it to reject frames with errors and also allowing concentrators to be physically relocated and reconnected while the system is active with no data loss.

Easyreach for MicroChannel is available for SCO Unix, UnixWare, Unix SVR4.2 and Unix SVR4.

Stallion Technologies (07) 870 4999

Multi-media Interface

Mod-Tap Australia has introduced a new wall-mounted multi-media interface designed to house and protect terminated and unterminated optical fibres. It can accommodate up to six Domino modules in any combination, allowing the user to configure a single office outlet in fibre, UTP, Type 1 and coaxial media.

The new interface measures 19.7 cm by 15.9 cm by 57 cm, and company officials said it is ideally suited to those user applications which require more than one type of media per workstation.

Mod-Tap (03) 747 8322

Active Fibre Optic Ring

Australian firm INC Manufacturing has introduced the new INC 4069A 16-Port Active Fibre Optic Ring Multistation Access Unit (MSAU) for Token Ring networks. The unit is based on VLSI technology and incorporates an MSAU and fibre optic repeater in one unit, allowing users to attach up to 16 workstations to a Token Ring network, company officials said.

The INC 4069A comes standard with fibre optic (active) and copper (passive) ring-in and ring-out ports. INC officials said that because the unit has fibre optic and copper links built-in to the one MSAU, it can provide maximum distance between the network and the workstation, and uninterrupted data communication. In the the event of a power failure, the unit will automatically switch from the fibre to the copper link, and the network will continue to run without interruption.

A toggle switch at the back of the unit allows the user to select active or passive operating mode. Active mode means the unit will amplify and reshape the data signal it provides to the ring-in and ring-out, as well as extending transmission distance between other fibre MSAUs up to 3,000 metres. Operating in passive mode, the 4069A functions simply as a standard 16-port MSAU.

The 16-port Active Fibre Optic Ring MSAU is available in three models: the INC 4069A with 16 data connectors, the INC 4548A with 16 shielded RJ-45 connectors, and the INC 4549A with 16 unshielded RJ-45 connectors.

INC Manufacturing
(02) 525 8411

New Hewlett-Packard Routers, Price Cuts

Hewlett-Packard has released two new multiprotocol routers, and has reduced prices on four of its existing HP EtherTwist bridges and routers by up to 24%.

The new routers are the HP 27290A FDDI Backbone Router BR, and the HP 27287A Ethernet Router LR. Officials from HP said the new routers eliminate router bottleneck by providing concurrent multiprotocol routing and bridging at full Ethernet-media speed, and use 25MHz Motorola 68040 processors and multiple-bus architectures for high performance in multiprotocol networks with high traffic loads.

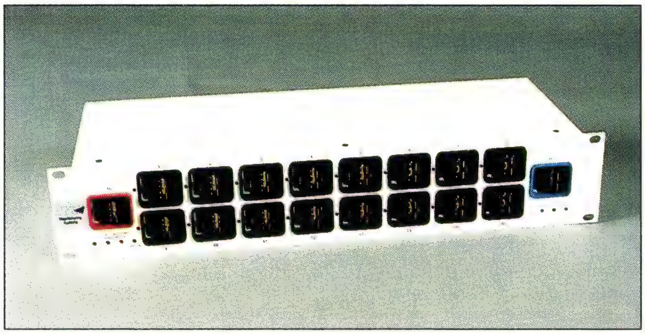
The routers feature HP's Quick-Config utility, which allows network managers to set all basic router parameters by answering a simple series of questions. A complete configuration editor is also available for detailed tuning of each router's configuration.

Both new routers support concurrent operation of TCP/IP, Novell IPX, AppleTalk II, DECnet IV and Xerox XNS. For packets that cannot be routed, the HP routers function concurrently as multiport MAC-layer bridges with the IEEE 802.1 Spanning Tree Protocol Version 9, allowing for network topology that contains redundant bridges. Each router provides four Ethernet ports with a choice of AUI or BNC connectors.

The HP Router BR supports IEEE 802.1 D transparent bridging for FDDI-to-FDDI links and IEEE 802.1H translation bridging for Ethernet-to-FDDI links. It also implements IETF RFC 1188 encapsulation bridging, which allows for IP routing between end systems on Ethernet or IEEE 802.3 LANs across an FDDI backbone, as well as to end-systems directly connection to an FDDI backbone. It supports connection to FDDI through standard fixed-shroud duplex media interface connector receptacles at 100Mbps data rates over 50/125 or 62.5/125 micron multimode fibre for distances of up to two kilometres, and includes a DIN-6 connector for attachment to an external bypass switch.

Both new Hewlett-Packard routers offer network management using SNMP.

The HP 27290A Router BR is priced at $19,849 excluding



INC's 4069A can attach 16 workstations to a Token Ring network tax, and the HP 27287A Router LR costs $11,909 ex tax.

The company has also announced that prices have been reduced on the HP EtherTwist Bridge Router product range. HP is offering a 24% reduction on the HP 28673A 10:10 LAN-Bridge MB (now $4,684); a 16% reduction on the HP 28-674B Remote Bridge RB (now $4,684); a 19% cut in the cost of the HP 27285A Router ER (now $10,321), and a 24% cut in the price of the HP27286A Router TR (now $10,321).

Hewlett-Packard 13 13 47

3Com Unveils High Speed Networking Strategy

Leading internetworking vendor, 3Com, has released details of a new strategy to migrate users to new high speed network environments without sacrificing investment in their existing platforms. Dubbed 'High Performance Scalable Networking,' the strategy involves the use of 3Com's LinkBuilder MSH and NetBuilder II bridge/router platforms and a clear migration path through to a 'routed ATM' architecture.

A central principle of the strategy is to allow seamless integration of existing LANs in order to avoid the expense of blanket upgrades. "3Com has listened to its customers and given them a multi-staged solution based on current products that protect their investments," says 3Com Australia General Manager, Nick Jackson.

Company officials say that power users, clusters of servers, high speed LANs and existing LANs running over traditional cabling can all be accommodated by the new strategy which is based around a multiport high performance router containing a collapsed network backbone. With this approach, the router typically resides in a building's basement and the wiring closet on each floor contains a hub which concentrates that floor's LAN segments. 3Com's ultimate backbone technology of choice for linking these devices is ATM which can prevent the proliferation of multiple FDDI, Ethernet, Token Ring and 100Mbps Ethernet backbone connections.

According to 3Com, as the collapsed backbone network becomes more segmented and addressing schemes become more complex, the single basement device will commonly be replaced by a cluster of devices and include a high speed router and an ATM switch. Company officials say this combination is required to fully exploit the multiplexing capabilities offered by ATM and the address and route management capabilities offered by internetworking devices. Without routing, 3Com says that an ATM-based collapsed backbone device can produce severe problems. When it receives ATM cells, the device compares the destination address of each cell with the addresses of the end stations contained in its address tables. If it is not capable of routing, the device broadcasts (or switches) each cell to all ATM ports. 3Com says this process can result in a broadcast storm, leading to severe degradation in network performance. In contrast, a combined router/ATM switch approach forwards the cells only to appropriate end stations, avoiding broadcast storms.

This routed ATM approach maintains segment identity, delivers firewall traffic control, and supports internetworking between LAN segments and between existing multiprotocol LANs and ATM LANs, company officials say.

The multi-staged High Performance Scalable Networking strategy has three components:

- *Stage 1 (1993/1994)* involves the deployment of multiple LANs based around a collapsed backbone. It is based on three capabilities: increased segmentation for greater bandwidth to the desktop; increased port density; and port grouping for virtual workgroup capabilities. Increased segmentation is available today on 3Com's LinkBuilder MSH hub which can support up to 10 Ethernet and five Token Ring segments; while increased port density and port grouping will become available for the NetBuilder II later this year and early next year respectively.
- *Stage 2 (1994)* is the deployment of a collapsed backbone with an ATM downlink and is based around 3Com's new CellBuilder technology which allows users on traditional media types to connect to to the ATM downlink through the LinkBuilder MSH hub. CellBuilder technology will convert Ethernet and Token Ring packets into native ATM cells for multiplexing onto a 155Mbps ATM downlink.
- *Stage 3 (1995)* will involve the functional integration of the basement bridge/router with an ATM switch. 3Com says the functionality required to support this stage will be introduced into the NetBuilder II and LinkBuilder MSH hub by 1995.

3Com Corporation (02) 959 3020

New BeyondMail

Melbourne-based ITS has announced BeyondMail Version 2.0 from Beyond Inc., which adds imaging and database support to its list of features.

In the new release, Beyond Inc has added Object Linking and Embedding-based document imaging software supplied by Massachusetts-based Watermark Software. The new release also includes native support for a broad array of databases including those from Borland, Oracle and Sybase; custom forms that can automatically interact with the databases, and native Global Message Handling System support.

Version 2.0 also offers automatic embedding of faxes and document images into e-mail, applications development tools, and intelligent routing. The imaging software from Watermark now gives the ability to scan documents, store them as bit maps, and route them across the network, said company officials.

The new version will also support Novell Standard Message Format 71, and Unix and Macintosh versions are due out early next year.

ITS (03) 826 6522

LinkBuilder FDDI Workgroup Hub

3Com has announced its new LinkBuilder FDDI hub, which officials said provides the same media flexibility that is available in a chassis-based hub, but in a compact workgroup concentrator at fixed port prices.

The cost of the LinkBuilder FDDI Workgroup Hub fully configured for shielded twisted pair media is $945 per port, while a fully configured model for fibre costs $1,890 per port.

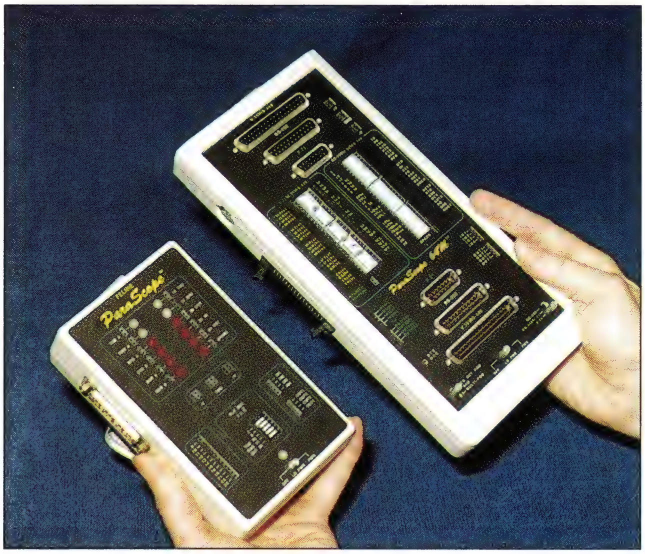
3Com (02) 959 3020

NCR Wireless Range

NCR has announced it has introduced its new wireless range of products, following registration by the Department of Transport and Communications.

The wireless products include WaveLAN, a network interface card for most AT or MCA PCs, and WavePOINT, a bridge that allows a network to transmit from a cabled to a wireless network while being transparent to the server.

3Com's LinkBuilder FDDI hub provides users with media flexibility



The Parascope analysers connect to the printer port of any PC

Company officials said the products use spread spectrum wireless technology, and offer users the option of further encryption for added data security. They utilise the 2.425GHz frequency range (centred), allowing higher speed data transmission (2Mbps) than products using the 915MHz band, which transmit at around 640Kbps.

Officials said typical coverage of the WaveLAN and WavePOINT products is between 120 metres and 180 metres in an open office with an aerial above partitions; 30 to 60 metres in an office where the aerial is below a partition; 15 to 30 metres in a totally closed office environment, and between eight and 10 metres through reinforced concrete.

Both WaveLAN and WavePOINT will support Ethernet and StarLAN initially, and a Token Ring version is due at the end of the year.

Operating systems supported include NetWare, NCR's StarGroup LAN Manager, Microsoft's LAN Manager, 3Com's 3+Open, IBM's LAN Server, IBM PC LAN Support, Banyan Vines, DEC Pathworks, Windows NT and Sun NFS.

The WaveLAN card will sell for $1,641 excluding tax, while the WavePOINT bridge will be priced at $4,329.

NCR (02) 964 8111

WAN Protocol Analysers

Ultracept Technology has announced it has begun shipping two products from Frederick Engineering. The Parascope and Parascope 64M are PC-based handheld protocol analysers that connect to the printer port of any personal computer.

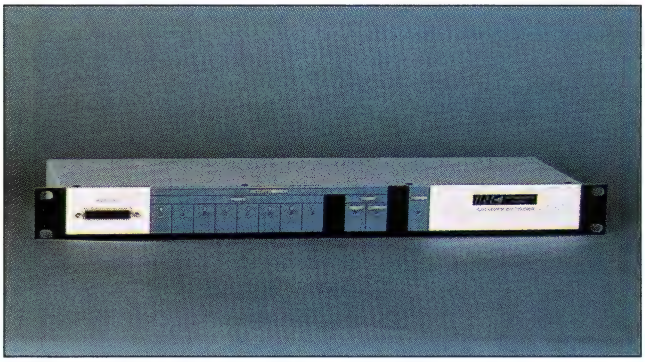
Both units come with Feline software version 7.81, and deliver monitoring and simulation for X.25, SNA, Q.921/Q.931 and other protocols, said officials.

Features of the units include playback on PC serial ports, BERT, graphical leads display, time stamp, trapping, selective data capture, remote control and auto setup. An onboard processor in the Parascope 64M ensures full duplex 100% line utilisation at rates of up to 64Kbps with a 386DX 25MHz PC.

The new Parascope is rated at 19.2Kbps with a 386SX PC running at 20MHz. Officials say performance increases can be achieved on faster platforms, or by using and EPP parallel port.

The Parascope 64M has built-in RS-232, X.21, V.35/V.36 and RS-449 (RS-422 and RS-423) interfaces. Both models provide breakpoints, test points, indicators and jumpering capabilities for supported interfaces, and the Parascope 64M has a standalone breakout mode.

Ultracept Technology
(02) 555 9284



INC's 5250 provides bi-directional reconstruction of the data signal

Multiplexer for IBM S/3X and AS/400

INC has announced its new 8-Port 5250 Multiplexer. The unit is based on VLSI technology, and makes it possible to extend the distance up to 6,000 metres between S/3X or AS/400 midrange systems and the last workstation. Workstations are connected via multidrop using a passive/active LWC or Active Star.

Each INC 5250 Multiplexer installation requires two units, the INC 4561A on the system side, and the INC 4562A on the device side. The INC 4561A is capable of multiplexing up to eight twinax ports into a single copper or fibre optic cable, said an INC spokesperson. On the workstation, the INC 4562A supports up to seven twinax devices on each port.

The 5250 Multiplexer offers complete bi-directional reconstruction of the data signal, reconstructing it to its original state by retiming, reclocking and reshaping the signal.

The unit also features a hot backup capability, automatically switching from the fibre to the copper cable if a problem occurs, without causing any interference in transmission.

The INC 4561A and INC 4562A are priced at $2,300 each, excluding tax.

INC Manufacturing
(02) 525 8411

Full Duplex EtherSwitch

NetComm has announced the new Kalpana Full Duplex EtherSwitch (FDES), which has the ability to double the bandwidth of point-to-point links in switched 10Base-T environments to 20 megabits per second, according to company officials. Netcomm will start to ship FDES-enabled both 10Base-T and 10Base-FL (FOIRL) EtherSwitch products late this year.

FDES increases Ethernet throughput by creating two collision-free 10Mbps data paths — one for transmitting and the other for receiving — on a single unshielded twisted-pair wire segment.

The transmit circuit at the end of the point-to-point connection is directly wired to the receive circuit at the other end of the point-to-point connection, which effectively forms a two-way data path between the stations. Because no other station than the two linked stations has access to the medium, each segment can provide full Ethernet bandwidth in both directions simultaneously, thus yielding 20Mbps throughput, said company officials. They said FDES technology offers dramatic improvements in throughput without affecting compatibility.

Key features of the product include backward compatibility with all existing 10Base-T and 10Base-FL systems, a switched-based architecture, and single port implementation, meaning the FDES uses only one port for each full-duplex connection.

The EtherSwitch also offers a switched-selectable FDES mode so that each port can be easily toggled between standard and FDES-enhanced Ethernet.

The EtherSwitch EPS-500 10Base-T Accelerators with full-duplex and SNMP support are priced at $10,495 including tax.

The new FDES-equipped Ethernet Packet Processor with a 10Base-T network connection, the EPP-203, is priced at $2,195 including tax, and the fibre optic version of the full-duplex Ethernet Packet Processor, the EPP-202, is priced at $2,995 including tax.

NetComm (02) 888 5533

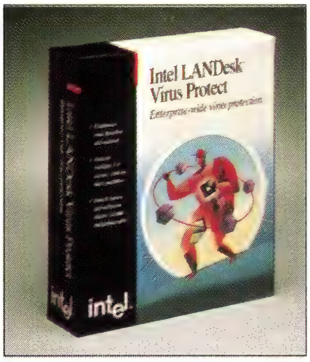
Critec's power protection devices conform to AS1768-1991

Intel Anti-Virus Software

Intel has introduced LANDesk Virus Protect Software which the company says can transparently monitor DOS, Windows, Macintosh and OS/2 network traffic to detect and isolate PC viruses, including all common known viruses, self-encrypting stealth viruses, polymorphic viruses and unknown viruses.

LANDesk Virus Protect utilises both pattern-based scanning and rules-based trapping to detect infection mechanisms and behaviours common to viruses. The software can also be scripted to automatically download new virus patterns to the server from the Intel Bulletin Board Service at user-definable intervals. LANDesk Virus Protect's NetWare Loadable Module implements the most current pattern library in the virus-library directory.

LANDesk Virus Protect is a NetWare-certified software, so it guards all file servers on Novell NetWare 3.11 LANs as will as connected workstations and standalone workstations. Using Intel's Smart Networking Services model it can also provide protection for mobile users when temporarily disconnected from the LAN.



LANDesk Virus Protect detects both known and unknown viruses

LANDesk Virus Protect is priced at $1,799 per server, and is available in four-server and twenty-server packs.

Intel (02) 975 3300

Wallmount Patch Unit

Mod-Tap has released a new Wall Mount Patch Unit for high density fibre or copper environments. The unit holds up to 12 System 100 Domino modules (24 ports) and can be easily mounted near file servers, hubs and development workstations, said a company spokesperson.

The panel can be mounted over single gang wall boxes for added flexibility, and can accommodate up to six angled fibre modules. It supports modules that are tested and certified for Category 5 compliance.

Mod-Tap (03) 747 8322

LAN Protectors

Critec has announced a range of standalone devices for protection against lightning and switching surges. The devices suit almost any network protocol or standard. The company said all modules meet the Australian standard for lightning protection (AS1768-1991), feature plug-in installation, and several models

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K100
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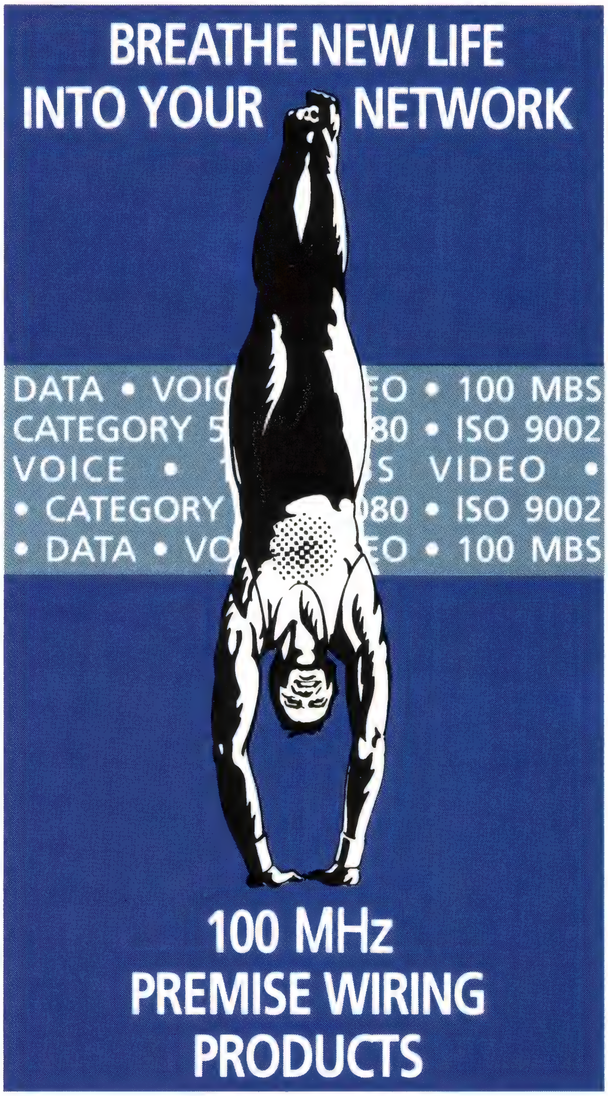

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combine a grounding fly lead to provide earth potential equalisation (EPE) via the computer's chassis to power earth.

Critec's Professional Series features two protected power outlets and a range of interchangeable data protection modules.

A 10A high performance filter which meets both AS1768-1991 and IEC801.5 standards ensures safe, clean power to the system, company officials said. Integral EPE between power earth and signal ground is also provided to help prevent any differential earth potentials from developing.

Critec (002) 73 0066

Remote Access

Rosser Communications has released a new feature option for US-based Wall Data's Rumba Gateway System that allows PC users to access an SNA host over asynchronous telephone lines.

The new Remote Feature Option can be incorporated in the Rumba Gateway System version 2.1, and adds eight remote users to the Gateway's capacity, supporting as many as 254 sessions over Ethernet and Token Ring.

Remote PC users are connected to host computing resources using standard modems over ordinary telephone lines. Local users are supported over NetBIOS, IPX/SPX, TCP/IP and Vines.

Reel Smooth solves the problem of cable kinking and twisting

The new Rumba Gateway System Remote Feature Option costs $2,790.

Rosser Communications (02) 418 2544

New Cable Dispenser

MM Cables has announced the launch of the Reel Smooth cable dispenser. The new dispenser is easy to de-reel, overcomes problems with kinking or twisting of cable, facilitates longer cable length (up to 500m), has two hand holes for easy moving, provides a view window to indicate remaining length, is stackable for multiple de-reeling, and offers personalised customer marking, according to a company spokesperson.

MM is offering five cable products in the Reel Smooth dispenser: the Mega Twistlan 4 4-pair Category 5 (100Mbps) UTP LAN cable; Super Twistlan 4 4-pair Category 4 (16Mbps) UTP LAN cable; Twistlan 4 4-pair Category 3 (10Mbps) UTP LAN cable; D203 3-pair indoor telephone cable; and D202 2-pair indoor telephone cable.

MM Cables (03) 541 2523

Wandel & Goltermann's LAN Cable Test Set runs on DOS-based PCs

LAN Cable Test Set

Wandel & Goltermann recently released the new LAN Cable Test Set SKM-215.

Company officials said the heart of the new test set is a new high-frequency balun, the SMZ-105/75. The most important parameters that can be measured are return loss, image attenuation and characteristic impedance up to 65MHz, and also transmission loss, near-end and far-end crosstalk up to 100MHz

The control and evaluation software package, SWP-215, means that no special computer or analyser knowledge is required for performing the measurements, said the officials.

Consistent menu control and intelligent test routines ensure that measurements are fast and reliable, and the results can be compared with predefined tolerance masks, allowing cables to be checked for suitability for a particular application.

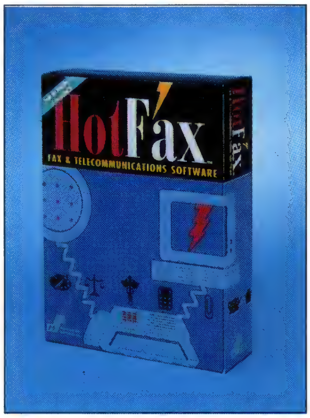
Test data is presented on-screen in graph or table form and can also be output to a printer. Two integrated databases store the test setting and the corresponding limit values for any number of different cable types. Subsequent recall from the database ensures that cable parameters for a given cable type are always recorded under the same conditions. The software runs on all MS-DOS computers.

Wandel & Goltermann (03) 690 6700

Remote LAN Management

Somerset Systems has just announced the release of GLAM, the Global LAN Administration and Management system.

GLAM is a distributed job scheduling facility which enables most network administrative tasks to be performed simultaneously, unattended, repeatedly and at a regular appointed time, according to officials from the company.



HotFax provides more than 10 data transfer protocols

GLAM's architecture is vendor independent, and automates administrative activities which are performed on a regular basis is to keep distributed systems functioning properly, helping to prevent Help Desk overflow, said the officials.

Using GLAM, a network administrator can submit a request for a task to be performed at several remote locations, and has the ability to specify such things as the time and date when a task is to be performed, the number of times the task is to be performed, and at what interval.

Somerset Systems (02) 908 2988

Fax Modem Software

Banksia Technology has announced new software for fax modems, called HotFax.

The software includes two features that company officials said are very useful for business users. FaxHost allows users to communicate with their remote computer via modem, and to view and re-route received faxes. FaxPost allows users to call in via modem and request transmission of specific faxes.

HotFax also allows users to send faxes directly from within any DOS application without interrupting their work, officials said. The software provides more than 10 data transfer protocols, including Ymodem-G, Zmodem, and CompuServe B+, offers a two-window Chat mode and comes with powerful scripting language.

Company officials said that in a suitable fax modem, HotFax can send and receive data using V.42, V.42*bis*, MNP 1-4 and MNP 5 data compression. The product sells for $249.

Banksia Technology
(02) 418 6033

DEC Bridging Router

Digital has released the new DECbrouter 90 multiprotocol bridging router, which is the result of a joint development between Digital and Cisco.

The brouter provides Integrated Intermediate System to Intermediate System (IS-IS), Open Shortest Path First (OSPF) and Interior Gateway Routing Protocol routing protocols on a single platform.

The DECbrouter 90 is available in two versions — 802.3/Ethernet to a single T1/E1 port, and 802.3/Ethernet to one T1/E1 port and one 64Kbps port. It interoperates with installed routers in both DEC and Cisco customer environments, and also includes an integrated SNMP management agent, enabling users to manage it from any SNMP management platform.

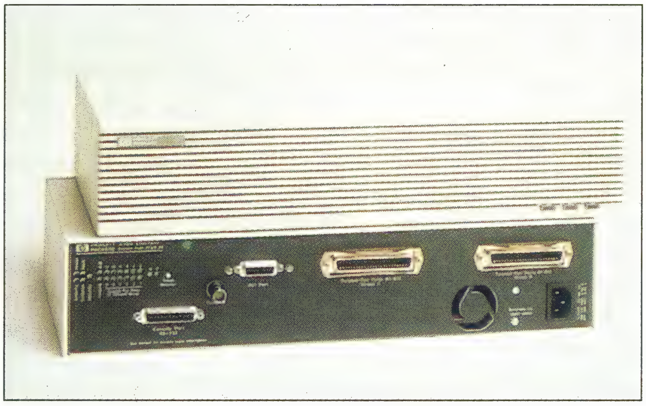
DEC (02) 561 5252

New HP RISC-based Stackable Hub

Hewlett-Packard has announced its new RISC-based EtherTwist Hub Plus/24 S, which the company said offers sophisticated security and performance features usually only found in high-end network products.

The hub is a 24-port 10Base-T repeater which incorporates AMD's HIMIB/IMR chipset.

The chipset monitors network traffic travelling through the hub, maintaining statistics on readable frames transmitted, collisions detected and other conditions, said HP officials.



The EtherTwist Hub Plus/24 S supports HP's new EASE technology

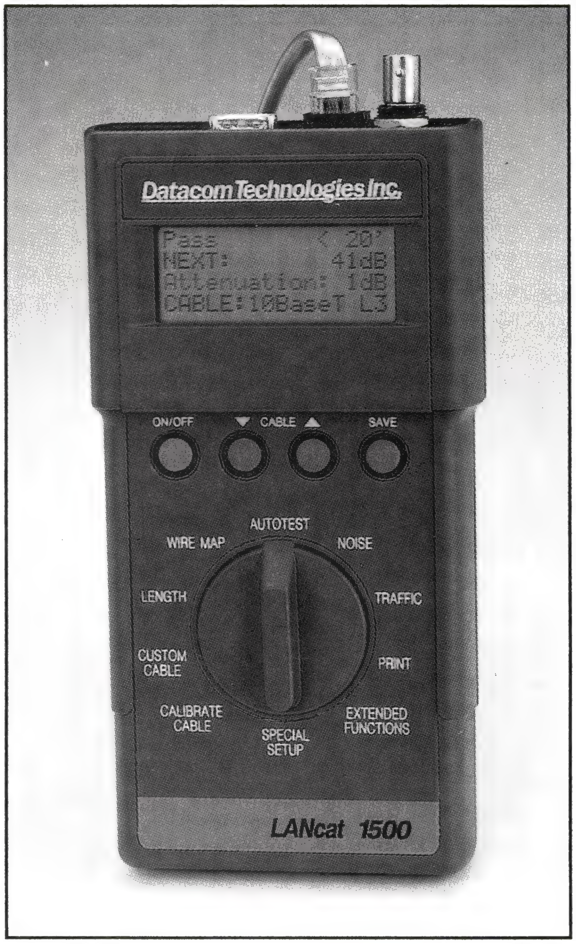
As it repeats and retimes signals and manages collisions, the Hub Plus/24 S monitors individual link status, automatically segments individual ports that are experiencing problems and reconnects them when the problems are cleared, said the officials. LEDs indicate security, port status, collisions, activity, faults and power. The hub supports full SNMP/IP and SNMP/IPX management and HP's EASE technology. It has an eavesdrop-prevention feature that restricts sensitive data to the intended recipient. When enabled on a port, the port may receive valid data packets only if its station address matches the packet's destination address.

The HP J2355A EtherTwist Hub Plus/24 S costs $4,660, and comes with a lifetime warranty.

Hewlett-Packard 13 13 47

Solaris for x86

Computervision Services has announced it is now distributing SunSoft's Solaris for x86 soft-



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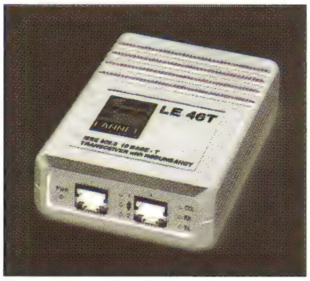

Lannet's LE-46T maintains dual links from vital network resources

ware in Australia. Solaris is a software environment for large volume RISC and SISC microprocessors. It combines built-in networking, multiprocessing, system and network administration and security with ease of use, according to the company.

Solaris for x86 is a feature-for-feature port of Sunsoft's Solaris for SPARC software. Officials said built-in networking is based on the industry-standard ONC+ networking technology and seamlessly connects legacy systems with workstations and PCs anywhere in the world. The JumpStart feature provides automatic network installation, while the Network Profiling feature allows managers to remotely tailor machines for particular types of users.

The System Administration feature provides tools to connect and configure systems remotely and set up print services anywhere in an enterprise.

Computervision Services (02) 844 8222

Intelligent Transceiver

Toren Computer Communications has announced the Lannet LE-46T Ethernet 10Base-TUTP transceiver with advanced fault tolerance.

The LE-46T comes with one AUI port and two shielded RJ45 ports for connection to UTP or STP environments. It allows users to establish dual links from vital network resources such as servers and printers, to two separate points in the network. While one link is active, the other is maintained in standby mode, and is automatically activated if a fault develops in the active link, said officials from the company.

The LE-46T includes two selectable operation modes.

Standard mode provides receive link status per the IEEE standard as well as automatic receive polarity detection and correction, while the Plus mode adds detection of remote link failures. A user-selectable extended sense mode permits UTP links over distances exceeding 160 metres.

All diagnostic information is provided on a LED display, allowing network managers to monitor power, received and transmit activity, collisions, link status and active ports.

Toren (03) 242 5050

Network Management

SynOptics has announced a new LattisWare Solution application called SwitchMan that delivers graphical tools for the optimisation of network configuration and performance and provides advanced management of Kalpana Ethernet switches.

SwitchMan is made up of three components — SwitchView, MatrixView and DesignView — that permit real-time monitoring of switch and network traffic.

SwitchView allows users to measure traffic levels and set thresholds for port utilisation, while MatrixView and DesignView work with SynOptics' Model 331xS Advanced Ethernet Network Management Modules to provide information about LAN traffic patterns.

The company also announced it has begun shipping the LattisNet Model 3328 Ethernet Switching Engine, which supports Full-Duplex EtherSwitch (FDES) technology. The Model 3328, which was co-developed with Kalpana, is a six-port module that fits into the LattisSwitch System 3000 intelligent hub.

The Model 3328 allows for multiple communications to oc-

The PC-based WAN protocol analyser family from Network General

```
12:01:11.09 | G Addr:c2 RR     Nr:6   PF:1 |
12:01:11.11 | G Addr:c1 Ms:5   Nr:5   PF:0 | DAF:02 OAF:01  REQ (SC) SDT
12:01:11.21 | G Addr:c2 RR     Nr:4   PF:1 |
1            C:\PSCOPE
1  Name          Size     Date      Time    F:01 OAF:02 +RSP (SC) SDT
1
1  ..           UP-DIR   1-15-92   15:45
1  connect  buf  32896  12-10-91   12:54
1  in_call  buf  32896  12-10-91   12:54
1  isdn_att buf  32896  12-10-91   12:54
1  isdn_nti buf  32896  12-10-91   12:54    F:04 OAF:01  REQ (DFC) BID
1  out_call buf  32896  12-10-91   12:54    F:02 OAF:01  REQ (DFC) BID
1  sna      buf  65664  12-10-91   12:54
1  x25      buf  32896  12-10-91   12:54
1                                           F:01 OAF:04 +RSP (DFC) BID
1
1
1                                           F:01 OAF:02 +RSP (DFC) BID
1
Decode: SNA  TRC DTR:↓ RTS/C:↑ DSR:↑ CTS/I:↑ DCD:↓ RI:↓ P11:↑        12:01:11:09
Cell #: 5214      Disk block #: 0
c2 41   BJ

1      2PATH  3      4      5      6      7      8      9      10ABORT
```

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cur simultaneously between the segments, increasing network efficiency and throughput.

It also provides full-duplex capabilities for interswitch communication, and helps to clear bottlenecks by allowing simultaneous parallel client-server communications.

The Model 3328 Ethernet Switching Engine is available for $7,800 or $1,300 per port. SwitchMan will be available for Sun SPARCstation users for $5,565.

SynOptics (03) 853 0799

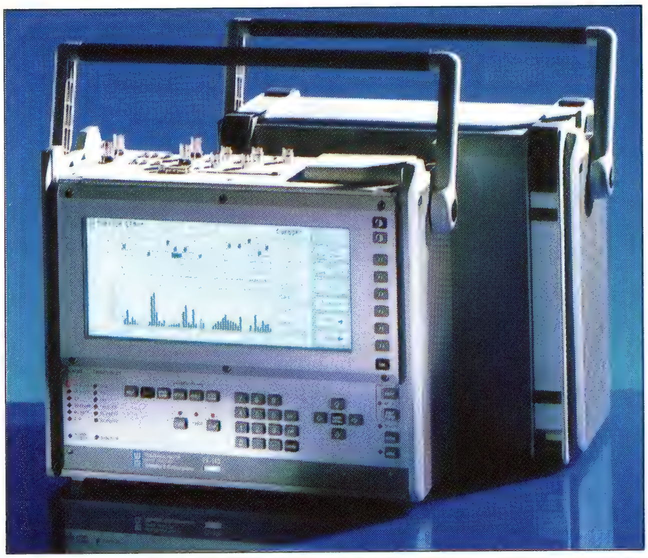
New OSI Offerings

Execp has announced that Proginet Corporation and IBM are working together to extend the Multiprotocol Transport Networking architecture to support general OSI applications running over SNA. These extensions to the architecture will then be used by Proginet as the basis for enabling its OSI product line, including Host.FTAM, a file transfer system for MVS/ESA, to implement MPTN. This will let OSI applications run across an SNA network without requiring any additional hardware, said officials. The MPTN-based implementation of Host.FTAM will become available in the first half of 1994, they added.

Execp (09) 220 3477

Field Error Analyser

The new Wandel & Goltermann PF-140 Error Analyser is especially designed for field use, and is lightweight with a protective cover. The company said that the unit is easy to operate, and includes everything necessary for commissioning and maintaining PDH transmission systems at bit rates from 2 to 140Mbps. Features of the product include generator and receiver for unframed bit error ratio tests (BERT), in-service monitor for framed signals, and loop-through mode with error insertion for comprehensive tests.



The PF-140 Error Analyser is especially designed for use in the field

An SDH option adds STM-1 monitor functions and loop-through operation, and the instrument can store errors, alarms and setups either internally or on a memory card for precise analysis of recorded data at any time.

Wandel & Goltermann (03) 690 6700

Wellfleet to Offer Dial-up Services

Wellfleet recently announced a three-phase strategy to provide users with abiility to access circuit-switched or 'Dial-up' services. Officials said the new

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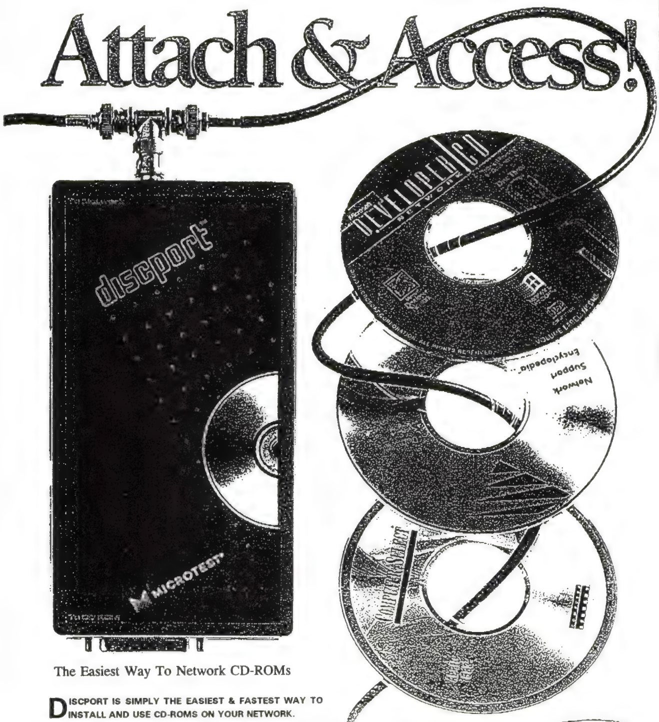

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The Speedycom transceivers are almost as small as a matchbox

services will provide Wellfleet users with cost-effective internetworking alternatives.

The Dial-up services,which are to become available in three phases, include Dial Back-Up, Dial-on-Demand and Bandwidth-on-Demand. Dial Back-Up can maintain network availability by establishing a dial connection if a dedicated wide area network link fails. Bandwidth-on-Demand maintains performance levels by establishing supplementary dial connections when a leased line or packet-switched link becomes too congested. Dial-on-Demand can provide cost-effective internetworking connectivity on an as-needed basis, which officials from the company said is especially useful for remote offices or mobile workgroups.

Wellfleet (02) 959 1290

Compact Transceivers

Speedycom has released a range of Australian designed and manufactured twisted pair, thin Ethernet, and fibre optic transceivers.

The units offer very compact design — approximately 4 cm by 4 cm by 2 cm, or slightly larger than a matchbox — IEEE 802.3 compliancy, and full compatibility with IBM, Sun and Macintosh computers. An official said the transceivers allow for the simple connection of nearly any computer system to any network wiring format.

The units come with a two-year guarantee, and other features include a unique internal power-supply module and C-MOS technology chipsets to minimise power consumption and reduce heat dissipation.

The thin Ethernet transceiver offers high speed receiver architecture for minimum jitter, smart squelch noise filtering and improved coaxial isolation giving less distortion. the UTP transceiver has SQE enable/disable, smart squelch, balanced noise filtering and compensation, and auto polarity to detect and correct inverted received data. The fibre optic transceiver is supplied with standard SMA connectors and incorporates the latest generation of integrated circuits.

The transceivers can either be attached directly to the AUI port, or housed in a patented wall-mount unit.

Diagnostic LEDs on each transceiver include Power and Transmit for the thin Ethernet model, and Recieve, Transmit, Link and Collision on the UTP and fibre optic models. The fibre model also has and additional Jabber LED.

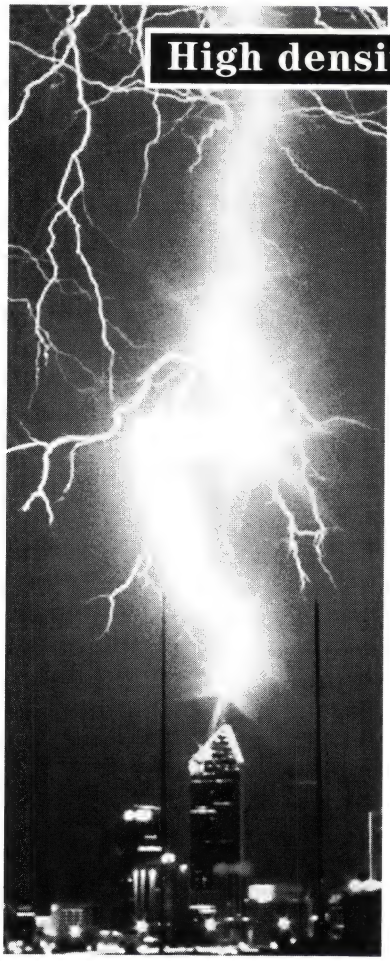
Prices range from $72 for the UTP transceiver, to $90 for the thin Ethernet version, and $350 for the fibre optic model. All three models are fully guaranteed for two years.

Speedycom (09) 388 1755

Hewlett-Packard Network Management

Hewlett-Packard recently released two new MS Windows-based LAN management software packages. The HP OpenView Workgroup Manager/Windows and HP OpenView Interconnect Manager can automate common management tasks and provide easy-to-use, graphical control of network devices, according to an HP spokesperson.

OpenView Workgroup Manager/Windows provides workgroup-level network management for hubs, printers, PCs and workstations. Using its discovery and layout capabilities, it automatically learns what is on the workgroup network, down to the level of identifying PCs on each desk and printers or plotters on the network. It then



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Critec Subscriber Line Protection

As the modern PABX is highly sensitive to transient voltage disturbances the traditional gas-filled arresters by themselves are no longer sufficient protection for telephone circuits. Critec has designed the SLP, Subscriber Line Protector for the telephone line, and the PLF, Powerline Filter for the mains supply. Together these two devices form an integrated protection scheme for any PABX, office system or switching centre.

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The SafeLine range of panel mounted Surge Reduction Filters from Critec incorporates high energy clamping with efficient low pass filtering. SafeLine SRFs are available in single or three phase configurations for load currents of 10A and 16A per phase and are installed in series with the circuit, usually at the local distribution board. For more information fax back this page to **002•73 0399**, or send in the coupon below.

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CRC-A274 OZ

automatically prepares a hierarchical network map accurately depicting the network topology, with icons representing each device, said the spokesperson.

It can be scheduled to automatically check all network devices at specified time to keep track of new devices added to the network.

By selecting icons on the map, managers can monitor and control HP EtherTwist hubs as well as monitor multivendor SNMP/IP or IPX devices.

Interconnet Manager also includes HP's Resource Manager/ DOS to provide real-time trend analysis using HP's new Embedded Advanced Sampling Environment (EASE).

The company spokesperson said network administrators can monitor trends on the network by indentifying top talkers, heavy users, communication pairs and errors and their sources. Interconnect Manager monitors network activity using IP, IPX or MAC addresses to identify potential network trouble spots, presenting this complex information as pie charts, bar charts or time-series charts, the spokesperson said.

Both Workgroup Manager and Interconnect Manager provide standards-based network printer management capability, so managers can treat HP printers and plotters with embedded SNMP agents like any other network device.

They can receive remote printer information and event notification and perform printer management functions from the management console just as they would with a hub or workstation, said the spokesperson. From the management console, managers can determine a printer's model number, configuration information, status and network interface information.

The HP 28686E OpenView Workgroup Manager/Windows is priced at $3,112, and the new HP 27256E OpenView Interconnect Manager/Windows sells for $6,223.

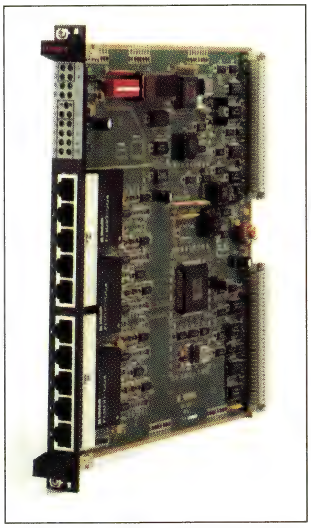
Hewlett-Packard 13 13 47

New Lannet 10Base-T Ethernet Module

Toren Computer Communications has released a new enhanced Ethernet module from Lannet, the LE-140XTN. The module is a plug-in 10-port 10-Base-T UTP or STP module for use with Lannet's MultiNet II Smart Hubs. It is fully manageable under Lannet's MultiMan management system.

Company officials said the LE-140XTN can be connected to any of four Ethernet LANs within the hub, remotely selectable from the MultiMan SNMP management console. The module can also operate independently in standalone mode as a multiport repeater. Increased reliability and reduced power consumption are provided by onboard VLSI design, they said.

The module also supplies port redundancy with automatic switchover, LAN redundancy with automatic switchover to a backup Ethernet LAN, and advanced failure protection, said the officials. Diagnostics provide indications of port and module status, and additional diagnostic features are provided in 10Base-T Plus Mode, including detection of transmission link failure.



The LE-140XTN provides detection of transmission link failure

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Upon registering at ATUG'93 visitors were requested to indicate the communications/networking publications they regularly read. Judging from the **4,690*** completed questionnaires *Australian Communications* is clearly the choice of communications professionals

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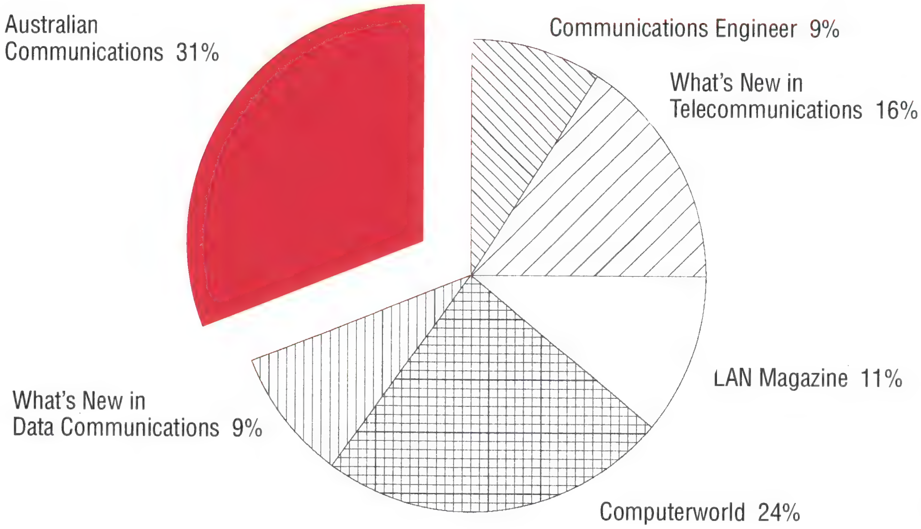

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International Broadcasting and the Asian Frontier

The headlines say it all: 'ABC Joins US Cable Giants in Asian Satellite Service;' 'AsiaSat 2 Fully Booked: Star TV to Expand Services;' 'Taiwan Satellite to Feature Chinese Language TV Services;' 'Sixty Million Grateful Indians Watch *Neighbours*.' The converged world of telecoms and broadcasting is changing the world of broadcasting irrevocably. Our televisions will soon resemble shortwave radio dials, with services beaming in from around the world (although I hope with better reception than good old HF radio).

Hong Kong-based Star TV recently announced it was opening two offices in India (in Bangalore and Calcutta) to add to its present offices in Bombay and New Delhi. Star is also opening no less than five new offices in China — in Beijing, Shanghai, Guangzhou and Chengdu. The company already has overseas offices in Singapore and Taipei, and also announced its intention to serve homes in Malaysia, Thailand and Egypt.

Egypt? One of the 'unintended consequences' of Star TV's coverage over the AsiaSat satellite was its warm reception (so to speak) in the Middle East. Hundreds of thousands of viewers in the Gulf region and other parts of the Middle East may receive the AsiaSat signal to supplement their often spartan terrestrial television choices.

Is it really desirable that *Neighbours* be beamed across half the planet? Those in the satellite and international television programming sectors are often impatient with those who put forward cultural questions and concerns. Certainly, the impact of international broadcasting is often hard to predict. Moreover, we often underestimate the positive benefits of international broadcasting. Shortwave radio remains *the* electronic medium for large chunks of the planet where technology is primitive and domestic media limited or censored. Radio's versatility and low cost guarantees this will remain the case for many years. For example, services such as Radio Australia and Radio New Zealand International provide lifelines to the outside world for most of the Pacific Islands, often providing news about their own countries that islanders would never hear over their own media.

> *"Certainly, the impact of international broadcasting is often hard to predict. Moreover, we often underestimate the positive benefits of international broadcasting."*

International television services have followed somewhat different patterns. Certainly, television elicits cultural concerns that are largely absent in the discussion of international radio services. Even in Canada, where four decades of balancing domestic and foreign (read US) television would lead one to expect a certain equanimity, the spectre of commercial US DBS services led to warnings of a 'Television Death Star' from over the border. Likewise, there is some evidence that Star TV's popularity in India and the sub-continent is genuinely changing the face of popular culture in the region.

Within the telecommunications sector, I believe the concerns regarding international broadcast satellite services spring from a different well, although not as unrelated as you might think. Broadcasters themselves are adopting aggressive international policies to ensure their viability. The ABC's Bruce Donald was quoted in *Satellite News* as saying 'We are all moving on a number of fronts to protect our future in a rapidly growing market.' Primary among those fronts for ABC is an alliance with Hong Kong's TVB, Turner Broadcasting System Inc., ESPN International and HBO Asia. This alliance will lease transponders on Indonesia's Palapa B2P and, upon its launch next year, Apstar 1, which will provide full coverage of Papua New Guinea, Singapore, Indonesia, Thailand, the Philippines, Malaysia, Hong Kong, parts of China and the rest of South East Asia.

In North America, Canada has reacted to the DBS threat from the US by leasing channels on one of the so-called 'death stars' (namely Hughes' DirecTv) and turning the situation to its advantage by configuring additional channels as an 'external service' of Canadian programming aimed at the US audience. This guarantees a Canadian presence and creates a potentially valuable second market for programmes.

Other countries are also blending cultural imperatives with commercial craftiness to great advantage. The desire of Korea and Taiwan to launch national satellite services seems rooted in both solid business sense and a natural desire to guard their culture. In Korea, the popularity of Japanese broadcast satellites is not viewed kindly by officialdom, and certainly has acted as a catalyst for new Korean broadcasters as well as Koreasat itself. In Taiwan, a possible fear of losing ground to Hong Kong and, ultimately, mainland China, has led to an official and unofficial push to develop a Taiwanese space programme and satellite system to serve the entire region. However, covering all bases, Taiwan is also a partner, with Hong Kong and China, in the APT Satellite (APstar) consortium.

The success of Star TV and the plethora of new systems to be featured on the region's new satellite illustrate both the strength of international broadcasting in the 1990s as well as the supremacy of the Asia-Pacific region as international broadcasting's brightest frontier. This was not always seen to be the case. In the late 1980s, it was thought that the pan-European market, seemingly forging closer as the idea of 'European 1992' grew, would reap the most rewards for international broadcast services.

Even before the recession hit, it was clear that Europe's satellite services would shear off according to language groups. The original pan-European goals of Sky Channel and SuperChannel became the far more narrowly-defined worlds of UK-focused Sky (later BSkyB) channels, 'UK Gold,' and so on, with services such as BBC Europe and the French-language TV5 providing the exceptions proving the rule.

The level of satellite activity in the Asia-Pacific region is complemented by the fast and frenetic fibre optic cabling of the region, country-by-country, sea-by-sea, ocean-by-ocean — from domestic ISDN to the 'SEA-ME-WE' FLAG fibre optic cable. The end result, transparent to the user, will be a huge variety of 'broadcast' and telecom services, a high level of interactivity, and an equally high level of service available on demand.

Ultimately, the objective of a 'video dial tone' or 'switched video' is one where the domains of satellite *and* fibre will benefit. The world of international broadcasting services will continue to be the highest-profile edge of the telecommunications world, as it is that aspect of our industry that reaches into every household and sitting-room.

James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of the Pacific Telecommunications Review.

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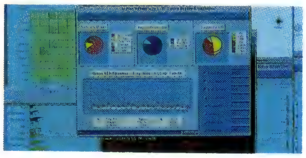

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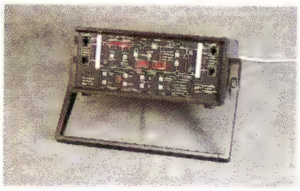

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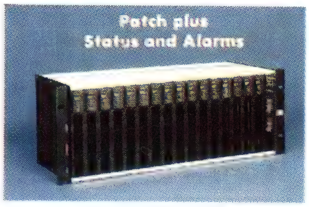

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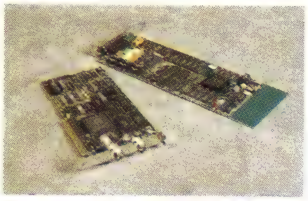

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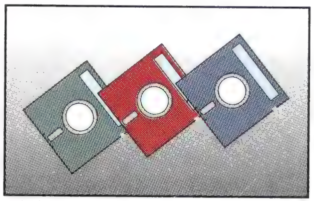

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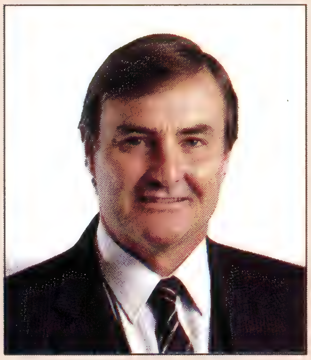
ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

From the desk of the Executive Director

Experts Group Examining Information Super Highway



Wally Rothwell

One of the pre-election undertakings of the Prime Minister was support for the construction of an information super highway to Australian homes and offices, using a combination of fibre optic and co-axial cable.

The potential for national development, in terms of education, business services and entertainment, is enormous and early installation of such infrastructure could give Australia the jump on many of its international commercial competitors.

The new Minister for Communications, David Beddall, has been given the job of implementing the project, and he has told ATUG, during an early August consultative meeting, that an 'Experts Group' will be set up to oversee the task.

That group is about to have its first meeting, and will finally report to the Minister after a year's activity and the submission of an interim 6-month report. ATUG is represented and we will continue to provide the users' requirements to the Experts Group.

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The first signs of activity, post the election, appeared with the much-publicised formation of the Packer Murdoch Telecom (PMT) group, which can be expected to be a major, if not the sole player in the building of the broadband super highway.

The Issues are Complex

There are, of course, a number of complicated issues which arise from the PMT initiative and the task presented to Minister Beddall, in juggling all the related considerations, is not an enviable one.

If ever an example was needed to show how convergence of telecommunications broadcasting and computing technologies was taking place, this project is classic.

Clearly, the market for interactive education, business and entertainment services looms very large in the not-too-distant future and broadband service to the home, classroom and office can provide for that market.

A significant consideration too, is that the home or office-based interaction may not require anything like the bandwidth being broadcast to them, and so the feasibility of a return radio link may obviate the consumer requirement for super-wide bandwidth to the home.

Further, as all the aspirants for the long-overdue Pay TV service line up with their various technologies, it becomes clear that Digital Audio Broadcasting (DAB), Multipoint Distribution System (MDS) and Telecom's Asymmetrical Digital Subscriber Link (ADSL) will be competing with fibre optics, co-axial cable and satellite distribution, as the broadband highway is being rolled out.

ATUG's Concerns

ATUG's main concerns are that this project should be developed in line with the user requirement and that it should be, in the Minister's words to us, 'a network accessible to all at reasonable cost.' We would like to add that access to the network, by all who would propose to provide services over it, should be on an equal access basis.

The emergence of the PMT consortium complicates the issue of equal access. It is not a general carrier in its own right, and therefore cannot provide lines for telecommunications services to the public, although there appears to be nothing standing in the way of it providing entertainment services.

There is also the question of Telecom, by itself, building an overlaid broadband monopoly Carrier Access Network and controlling the whole information stream to the home, while also entering the 'content' market.

Optus chief, Bob Mansfield, was quoted recently as saying that such a situation would be a tragedy, and while ATUG shares some of his concerns, especially Telecom's joint involvement with both carriage and content, the race to provide domestic broadband services can't wait until Optus gets to the starting line and Telecom cannot afford to be a non-starter.

ATUG's Close Brief

Overall, therefore, it seems to be a sensible initiative to set up an Experts Group in order to fast-track the broadband services project.

ATUG will be keeping a close brief to ensure that user concerns of equal access, affordable cost and national productivity benefits are taken into account. We will welcome comments from our members and the public at any time.

Wally Rothwell
Executive Director

ATUG's Position on Preselection

ATUG raised the public profile of the preselection ballot by holding the first public debate during this year's annual convention, ATUG'93. The following provides some answers to common questions being asked about the ballot from a business perspective:

1. ATUG is an advocate of the preselection ballot. In any case, Austel has directed it to be held, and the Minister has shown no inclination to interfere in that decision.

2. The ballot, on an area-by-area basis, follows a period when users will have had 5-9 months experience of *Dial 1* access to Optus as a long distance carrier.

3. Preselection is beneficial to telephone users because they will not have to dial a prefix. It is considered a fairer way of giving the second carrier equal access to the market, because dialling an extra digit is seen as a disadvantage to Optus.

4. Given the requirement of the national numbering plan, it would be impractical to continue to use *Dial 1* access indefinitely. Furthermore, *Dial 1* access is not available at all exchanges, so some customers would not have access to Optus' long distance until Telecom modernises those exchanges.

5. When there is an open telecommunications market after 1997 there will probably be more than two general carriers. Accordingly, *Dial 1* access would have had to end, even if other factors were not involved.

6. Preselection does not lock customers in to one carrier. Even after preselecting one carrier, customers will still be able to access the non-selected carrier's services by dialling an override code before dialling the B party's number. Override codes allocated are:

- Telecom 1411
- Optus 1456

As well, customers may change their preselected long distance carrier if they wish to do so. On the first occasion this will be free and customers will be informed about how they can require the change to be made. Subsequent changes may entail a small charge of $7-$10, but it is entirely possible that the carrier being selected might be prepared to pay the charge in order to get the custom.

7. Override codes can be programmed in to most modern touch phones so as to provide the equivalent of one digit access to the carrier not preselected.

8. Customers are not compelled to vote, and can either inform Austel that they do not wish to vote, or they can simply ignore the balloting form. In either of these two circumstances they will remain Telecom customers for long distance services unless they use an override code to access the Optus network on a call-by-call basis.

9. Businesses with branches in more than one balloting area can elect to make a preselection choice for the enterprise nationwide. To do so they need to send a letter of advice (LOA) to the Ballot Administrator 10 days before the ballot is due to take place in a particular area. That letter has to include the following:

- The name of the enterprise;
- Its ACN number;
- Identification of the billed services to be preselected as one choice; and
- An undertaking that the person signing is properly authorised to represent the enterprise's decision.

The ballot administrator's address is *GPO Box 6666 Sydney NSW 2001*.

This provides an excellent opportunity for organisations to compare the lines which Telecom says it is providing with those understood by organisations to be in use.

Those who intend offering a letter of advice can seek from Telecom a list of their lines around the country. You should contact your Telecom Account Manager or, if you are uncertain who to contact you can write to the Regional Sales Manager of the Commercial Business Unit, Telecom Australia.

ATUG is holding a list of the regional addresses, or you can call *132000* for your regional address. You should expect advice back in a matter of hours, if you have telephoned and your list is quite short. Otherwise, expect a delay of three or more days, depending on the size of your organisation and the number of people seeking this kind of advice.

10. There is no reason why large users of telephone services should not nominate, say, half their lines to Telecom and the other half to Optus, and compare long distance billing as a simple, if not precisely accurate way of comparing the relative value of using each of the competitors' services, both for price and quality.

11. Smaller users could base their decision on the amount of long distance traffic they generate. Broadly speaking if users have no, or very little, long distance traffic they are probably best advised to elect to remain with Telecom, as it will save getting two bills.

If a user's long distance calls (or faxes) are more extensive (and one suggestion has been of the order of $40 or more a month), as a general rule, they may be

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better off, from a cost point of view, preselecting Optus.

An illustration which appeared in the *Australian Financial Review* of 14 July showed that, during the extended business hours of 8am to 8pm weekdays Optus is 'cheaper' or even 'much cheaper.' (However it is impossible to predict the tariff changes which will occur, and how the different FlexiPlans or Strategic Partnership Agreements which Telecom offers could influence the situation for different individual companies. No general advice is practical; everyone must decide for themselves given their own set of circumstances.)

12. To vote or not to vote? There has been a view expressed by some consumer organisations and trade unions that individuals should opt out of the ballot or just not vote.

In that event, there may be a less than 65% response which could require a second ballot form being sent out to those non-voters who had not formally notified the Ballot Administrator that they preferred not to vote. This would involve more unnecessary expense.

Altogether, ATUG recommends that everyone should vote, regardless of their intention or the amount of their long distance traffic, as this will:

a) Limit the need for a second ballot, and

b) Give a much more representative view of the market's attitude. (A 10:1 imbalance between the carriers could give a very misleading impression).

13. Details of how the results of the ballot will be announced, and how individual consumers will be advised that their number has been preselected at their local exchange, are still to be advised. Consumers can expect to know what to do though, within about 10 days of the ballot closing. Once they have had their preselection set up, they will no longer need or be able to *Dial 1*.

14. If users preselect Optus they will get two accounts — Optus for their long distance traffic and Telecom for local calls, and service rental (and any other equipment if provided by Telecom). This could be another factor users should consider when making a decision for or against selecting Optus.

Important Numbers for Further Questions

▪ Ballot Administrator	008 062 333
▪ Telecom	008 626 008
▪ Optus	008 500 500
▪ ATUG	008 226 281

WHO'S WHO ON STANDARDS FOR ATUG

ATUG is represented on a number of Austel Working Groups to facilitate the development of Australian standards in telecommunications. The contact details of members on the Austel Working Groups are listed below. Members are invited to contact any of the representatives if they have any suggestions with regard to the working groups.

Working Group 1/1 — Electrical Safety and Earthing: John Hilliard, Prospect County Council, Tel: (02) 895 9131 Fax: (02) 895 9143.

Working Group 2/1 — PSTN Interface: David Le Comte, PollStar Communications, Tel: (02) 879 6365 Fax: (02) 817 4360.

Working Group 2/2 — Private Network Code of Practice: Robin Bray, Vistel Pty Ltd, Tel: (03) 651 4049 Fax: (03) 654 8528.

Working Group 2/3 — Broadcaster Interface Standards: Mike Bridle, Australian Broadcasting Corporation, Tel: (02) 333 5250 Fax: (02) 333 5227.

Working Group 4/2 — Digital Cellular Mobile Telephone System: & **Working Group 4/3 - Advanced Cordless Telephone:** Maurie Dobbin, Teleresources Pty Ltd, Tel: (02) 975 2230 Fax: (02) 975 2240.

Working Group 6/1 — Cabling, Wiring Rules and Cable Licencing Requirements: Alan Sangster, Network Exchange Pty Ltd, Tel: (02) 369 1786 Fax: (02) 389 3733.

Working Group 7/1 — ISDN: Gavin Foers, ANZ Bank, Tel: (03) 869 2380 Fax: (03) 869 2380.

Working Group 12/1 — End-to-End Network Performance Standard: David Donnarumma, BHP Information Technology Facilities Management Tel: (03) 609 3847 (NB — The above list was provided by Austel, and was current as of June 22, 1993.)

Standards Representatives Wanted!

Members wishing to participate on the following Austel Working Groups should contact ATUG on (02) 957 1333:

- Working Group 2/3/1 — Analogue Audio
- Working Group 2/3/2 — Analogue Video
- Working Group 2/3/3 — Satellite
- Working Group 2/4 — Line Isolating Devices Standard
- Working Group 3/1 — Switching (Non ISDN)
- Working Group 4/1 — Analogue Cellular Mobile Telephone System
- Working Group 4/2/1 — GSM Technical Sub-Group
- Working Group 4/2/2 — GSM Network Interconnect
- Working Group 4/3/1 — Telepoint Residential
- Working Group 4/6 — Satellite Communications/Inmarsat-M
- Working Group 8/1 — Video

Next issue we will be listing the details of members' representing ATUG on the Standards Australia Committees.

AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

Engineer in Court Room Drama

This is Part Two of an article by David le Comte about his experiences as an expert witness in a courtroom hearing. Part One appeared last month.

At the end of the hearing the referee is required to write a report for the court. Similar obligations are often imposed on arbitrators. In my reference, it was suggested to counsel that I issue a draft report prior to their final presentations. In this way, they could limit their final presentations to the matters addressed in the draft, rather than use the traditional method, whereby the evidence is simply dragged up and rehashed.

Though this was considered unusual, both counsels felt the idea had merit. It was generally held that this did save some considerable time.

During the hearings, the evidence presented indicated quite clearly that some fault could be levelled at both parties in the dispute. The written report reflected this. I felt obliged to recommend to both counsels that they attempt to get their respective clients to discuss settling the matter. Whether or not my advice was heeded will probably never be known, but the matter was settled out of court shortly after the report was presented.

An important attribute for a referee (or a technical witness before a reference) is to be able to speak without using too much jargon. Many engineers use correct grammar when writing, but as the transcripts at the reference showed, they (we) speak in a totally different manner. The court recorders use a phonetic system to record what is spoken. This produced some extremely strange results when engineers referred to such things as *CROs* (which became crows), *FET* (feet) and *rms* (aromas)! Reading the transcripts of the previous day's hearing each morning could be torturous, embarrassing, and amusing, all at the same time.

A New Perspective

Joking aside, the reference itself made me revise my previously cynical attitude towards the legal system. Several aspects of the reference were responsible for this. Firstly, I had suspected that the judiciary was reluctant to try new methods to resolve disputes. A reference is court-imposed and hence not 'alternative,' that is, it is not an Alternative Dispute Resolution (ADR) technique.

References are very effective in cases with some complexity, as an expert in an appropriate field is used to adjudicate on the more 'technical' aspects of the dispute. This saves time (and money) and may often lead to fairer decisions.

The judiciary have been imposing references for some time and they are now doing it more often. So it's clear that some of the judiciary at least have recognised the need for change and are acting on it.

Secondly, I had tended to assume that the legal profession opposed change. This view changed when I discussed methods of ADR with the counsel for the litigants. It seems that it is becoming common practice for the legal profession to actively promote arbitration to their clients, depending on the circumstances.

Hard Slog

The main challenge to my preconceptions, though, was in the amount of effort those associated with a dispute put into the task. One tends to think that the time spent in the formal atmosphere of the court or reference, or arbitration, constitutes the bulk of the effort involved.

In reality, that time is only the tip of the iceberg. In the reference which I conducted, the time spent in the hearings was only 20% to 30% of the total. What is even more salient is that the ratio for the legal counsel involved would have been far higher. They worked many long days and weekends coming to terms with relatively difficult technical issues. By the end of the reference they were so familiar with the issues that I suggested they consider becoming communication engineers. The only aspect of the profession they would need to learn is how to live on a quarter of their current incomes!

Specialisation

An interesting sideline to my involvement with this case was that I learnt that several legal firms have made the decision to specialise in the telecommunications area. Within the ranks of such firms you will find lawyers whose eyes do not glaze over when you talk of dB, frequency response, passbands, 2-wire and 4-wire switching, codecs, etc. Three such firms are Gilbert & Tobin; Sly and Weigall; and Freehill Hollingdale & Page. There may be more.

So, despite all the bad press the legal system gets, my experience proved to me that there are at least some hard working, intelligent, and honest lawyers (and one barrister) out there; that the demands of litigation require changes to the legal system and that these changes are occurring; and that, if you are asked to be a referee, you must be prepared to work very hard.

1993 INTERDATA HANDBOOK
NOW AVAILABLE!

ATUG has sponsored the third edition of the Interdata Telecommunications Handbook, published by IDP Interdata Pty Ltd. This easy reference guide to the telecommunications industry is offered to ATUG members at the discount price of $50, which includes postage and handling. To order, telephone ATUG on (02) 957 1333 or fax your order to (02) 925 0880.

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Polled Protocols: SNA/SDLC Over Frame Relay

The need to consolidate networks has prompted users to look at fast packet switching technologies like frame relay to carry multi-protocol traffic over unified wide area networks (WANs). SNA's Synchronous Data Link Control (SDLC), the IEEE 802.X series of LAN protocols or CCITT's Q.931 signalling protocol for Integrated Services Digital Network (ISDN) all correspond to layers one through three of the OSI model.

These protocols look substantially different at Level Three, but they all have similar Data Link Layers (OSI Layer 2). This Link Layer similarity between different networking architectures, and the need for a faster, protocol-independent networking technology, formed the basis of frame relay. Compared to conventional packet switching (X.25), where a data call is routed at Layer 3, frame relay moves the routing of the data packets to Layer 2. This facility combined with lesser overheads, compared to conventional X.25, provides higher throughput with frame relay, suitable to carry SNA/SDLC traffic.

SNA and frame relay

In the mainframe environment a front end processor (FEP) acts as the interface to the host and relieves it of the communications workload. Multiple ports on the FEP connects multi-drop lines to terminal cluster controllers (CC). In such an environment, the transmission facility broadcasts everything that comes out of the FEP to all the CCs connected, generating bursts of traffic. The CCs receiving this avalanche of information ignore everything except traffic specifically addressed to the particular CC.

The FEP controls this traffic by sending a series of messages called polls to the remote terminals, addressing each terminal in turn. This poll grants the addressed terminal the right to respond back briefly. Only one terminal at any time can attempt to transmit to the host. As a result, 40% to 50% of traffic in a SNA/SDLC network consists of polls rather than data causing the bursts in transmission.

SNA and FRADS

To convert SNA to frame relay form, a frame relay adaptor (FRAD) assembles data into frame relay frames at the sending end, then disassembles the frames at the receiving end to deliver the data as sent. Different varieties of FRADS can be used to connect SNA networks to frame relay.

A simple Terminal FRAD (TFRAD) provides a straight encapsulation of everything sent from the FEPs. The Host FRAD (HFRAD) emulates some of the functions of the host/FEP, like polling/selecting, flow control, error recovery and so on. This technique is sometimes referred to as 'spoofing.' HFRADs are intelligent enough to manage the polls at the end points, instead of passing them to the backbone network.

Frame relay solution

An SNA network can be connected to frame relay using a combination of FRAD types — a TFRAD for remote sites with single SDLC connections; and intelligent H-FRADs at the host site to terminate large numbers of SDLC connections and provide Token Ring access.

A FRAD that understands SNA protocols can add a lot of flexibility as well as improve the performance of the network. When such a FRAD is set up to recognise individual terminals, it can apply a random data link connection identifier (DLCI) and a terminal ID.

According to frame relay standards, nearly 1,000 DLCIs can terminate on a single physical port, thus emulating a multidrop circuit. Terminal identifiers can be assigned to any multidrop line (emulated), and terminals attached to one CC can belong to different polling groups. To improve the throughput, poll traffic can be reduced by intercepting and acknowledging locally at the FRAD end, and data frames directed to only one destination.

Conclusions

SNA over frame relay networks offer all the functions of a leased line network with the flexibility of connection and ability to modify the network without changing the FEP.

Subra Venkat is Business Development Manager, Fujitsu/CompuServe Network Services and Vice Chairperson of the Australia/NZ chapter of the Frame Relay Forum. He can be contacted through his CompuServe E-Mail address 76004,3202.

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FREE LEGAL LINE SERVICE

Members are invited to take advantage of ATUG's free Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal Sub-Committee, Gerald Wakefield. Members with legal queries in the following areas: international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law, are advised to consult this free legal advice service by calling ATUG on (02) 957 1333.
(A hotline for this service will be made available shortly.)

September

6-8 **Multimedia 1993**, Golden Gate Plaza, Sydney. This conference aims to prepare IT managers for mass market multimedia applications, and features key international speakers and six user case studies. Topics covered include an analysis of the real cost of multimedia development and delivery, future market trends, and copyright and legal issues. This event will also be held in Melbourne on 8-10 September. Fee: $1,895. Enquiries — IIR Conferences Tel: (02) 929 5366 Fax: (02) 959 4835.

8-9 **Disaster Recovery and Avoidance**, Hotel Intercontinental, Sydney. This conference is designed for managers of corporate finance, planning and IT, and deals with a range of possible disasters, from events like bombings to computer viruses, power surges and human tampering. The agenda addresses: assessing the critical time period for recovery; preparing contingency plans; how to control your public image during a disaster; and audit requirements for company officers. There will be an optional one-day workshop on producing a workable Disaster Recovery Plan. Fee: Two-day conference $1,295; one-day workshop $795; conference and workshop $1,795. Enquiries — AIC Conferences Tel: (02) 235 1700 Fax: (02) 223 8216.

14-15 **Cordless Communications**, Park Lane Hotel, Sydney. Featuring speakers from the UK, Finland, US, Hong Kong and Holland, this conference examines the potential of new cordless communications technologies, including: CT-2, DECT and wireless local area networks. An optional additional conference to be held on September 16 will explore applications for wireless LANs. Fee: Two-day conference $1,295; optional day $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

16-17 **World Telemedia Asia '93 and Voice International Asia '93**, Hong Kong Convention and Exhibition Centre, Hong Kong. World Telemedia '93 provides a forum for debate on the world's audiotex markets, and will examine global developments in audiotex, and opportunities in the Asia-Pacific region. Voice International will discuss the advances in technology and applications for voice processing around the world. Fee: $HK6,000. Enquiries — Triton Telecom Tel: +852 527 1126 Fax: +852 866 7940.

20-22 **Understanding Data Communications Networks**, Maritime Conference Centre, Sydney. This course aims to give professionals working in data communications a thorough grounding in communications protocols and standards, modem terminology and technology, hardware and software interfaces, multiplexers, and transmission media and their uses. Fee: $1,445. Enquiries — ITT Training Tel: (02) 959 5990 Fax: (02) 956 6375.

20-22 **Teleco Market Access '93**, Shangri-La Hotel, Bangkok. This conference examines the problems and challenges facing manufacturers seeking foreign type approvals, and aims to help companies speed the approval process in the Asia-Pacific region. A comparative approach will be taken to approvals for GSM, PABX, ISDN. Regulators from Asia, the US and the UK will explain and compare national certification programmes. The conference will also address issues such as conformity to country standards as a marketing strategy and the influence of the European ISO 9000 initiatives within the region. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

21-22 **Telecommunications Outsourcing and Virtual Private Networks**, Sydney Hilton, Sydney. This two-day conference is designed for managers concerned with the provision of telecommunications networks and services. It examines the new range of outsourcing services, facilities management and VPNs now available, and asks whether such vital resources should be placed in the hands of a third party. Fee: $1,295. Enquiries — IBC Conferences Tel: (02) 319 3755 Fax: (02) 699 3901.

27-1/10 **ASWEC '93**, Hyatt Kingsgate, Sydney. The 7th Australian Software Engineering Conference has the theme this year of 'Software Quality and Other Urban Myths,' and will feature papers on CASE, development environments, management of software developments and technical innovations. Enquiries — Institution of Radio and Electronics Engineers Australia Tel: (02) 327 4822 Fax: (02) 362 3229.

October

12-13 **Philippine Telecommunications Development Summit**, The Shangri-La Hotel, Manila. Recent government policy changes in the Philippines will mean expanded opportunities for foreign companies. This conference looks at the impact of the changing regulatory environment, tariff and pricing issues, the legal requirements of doing business in the Philippines, current and future trends in Philippine telecommunications, and the expansion plans of operators and service providers. Fee: $US895. Enquiries — AIC Conferences Tel: +65 222 8550 Fax: +65 226 3264.

12-14 **The Inmarsat International Conference and Exhibition on Mobile Satellite Communications**, CNIT, Paris. The first Inmarsat conference and exhibition in 1989 focused on the development of mobile communications. This year the conference will be addressing the future of mobile satellite communications, and senior-level speakers will present their views on a range of issues covering all aspects of the industry. The format will consist of plenary and streamed sessions, and there will also be a series of open forums. The exhibition will show the latest equipment in the field of mobile satellite communications. Enquiries — Tania Starley, IBC Technical Services Tel: +44 71 637 4383 Fax: +44 71 631 3214.

23-24 **Cable and Satellite Broadcasting** Sheraton Towers, Singapore. With the launch of three new satellites in the Asian region — Thaicom, AsiaSat 2 and Apstar 1 — the satellite industry in Asia is poised for dramatic growth. This conference will look at a wide range of related issues, including new technological advancements such as digital compression and future developments such as interactive TV, regional regulation, the growth of marine satellite communications, business strategies and venture capital developments in Pay TV, and special country presentations from Malaysia, Hong Kong, Thailand and Singapore. Fee: $S1,395. Enquiries — IBC Technical Services +65 732 1970 Fax: +65 733 5087.

24-27 **The IREE Communications Conference**, Hilton International Hotel, Melbourne. The IREE has announced this new conference, which will replace the former IREECON. This year's inaugural event will have the theme 'Communications: Foundations for the Future,' and will run streams on radiocommunications, telecommunications and industry support. The keynote speaker will be the newly elected Director of the ITU Telecommunications Development Bureau, Mr Arnold Djiwatampu. A highlight of the three day event will be a special 'Hypothetical' session featuring a panel of key industry figures. There will also be a trade exhibition of the latest technology and equipment. Enquiries — Tel: (02) 327 4822 Fax: (02) 362 3229.

25-28 **Broadcasting Cable and Satellite India '93**, Pragati Maidan, New Delhi. This event covers radio and TV broadcasting, satellite and cable distribution systems, sound, film and video and related services. It will look at new opportunities in India resulting from new strategies by the government designed to attract investment. A trade exhibition will accompany the conference programme. Enquiries — Conference: Broadcast Engineering Society (India) Tel: +91 11 371 9978 Fax: +91 11 331 6674; Exhibition: Exhibitions India Tel: +91 11 462 2710 Fax: +91 11 463 3506.

25-26 **ATA '93**, Hotel Intercontinental, Sydney. This two-day event is entitled 'Complete Communications — Convergence in Action,' and features key local and international speakers, who will discuss a range of issues including telecommuting and the Global Village, teleconferencing, multimedia, regional trends in communications and interactive media. Fee: $1,295. Enquiries — AIC Conferences (02) 235 1700 Fax: (02) 223 8216.

26-27 **Telecommunication Development in the Western Pacific**, Guam Hilton, Guam. The Pacific Telecommunications Council's October Seminar will cover a broad range of issues relevant to telecommunications in the Asia-Pacific region, including regulatory issues, applications of telecom technology, technical developments in switching, fibre optics, plant management and transmission, and the use of satellite services to meet regional needs. Fee: Members $US50, non-members $US100, students $US25. Enquiries — PTC Tel: +1 808 941 3789 Fax: +1 808 944 4874.

November

15-16 **ATM '93**, Sydney Renaissance Hotel, Sydney. This event provides delegates with the latest information on making the transition to ATM technology, and features experts who will discuss how to seamlessly integrate local and wide area networks through ATM. Fee: $1,295. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

16-18 **Middle East & Gulf Mobile Communications — Implementing New Digital Mobile Communications Systems**, Inter-Continental Hotel, Dubai. Concentrating on GSM and being held at a critical time in the region's development of mobile systems, this conference will examine operational experiences with the implementation of GSM cellular networks, the issues surrounding standards and roaming, and the future impact of other mobile services. A technical day will allow delegates to understand the practicalities of building a successful and profitable network. Enquiries — IBC Technical Services Tel: +44 71 637 4388 Fax: +44 71 631 3214.

28-1/12 **ACOFT-18 '93**, Northbeach Parkroyal Hotel, Wollongong. The 18th Australian Conference on Optical Fibre Technology will cover the latest research, developments, production applications and business strategies of optical fibres, waveguides, sources, detectors and other services for the telecommunications and sensors industries. A trade exhibition will be held in conjunction with the conference. Enquiries — Conference Secretary, IREE Tel: (02) 327 4822 Fax: (02) 362 3229.

30-4/12 **Vietnam Telecomp '93**, The Vietnam Exhibition and Fair Centre, Hanoi. This exhibition covers telecommunications, computers, broadcasting and office equipment, and gives exhibitors a chance to break into Vietnam's telecoms and data communications markets. Last year the event attracted over 30 vendors from 14 countries. Enquiries — Adsale Exhibition Services Tel: +852 511 0511 Fax: +852 507 5014.

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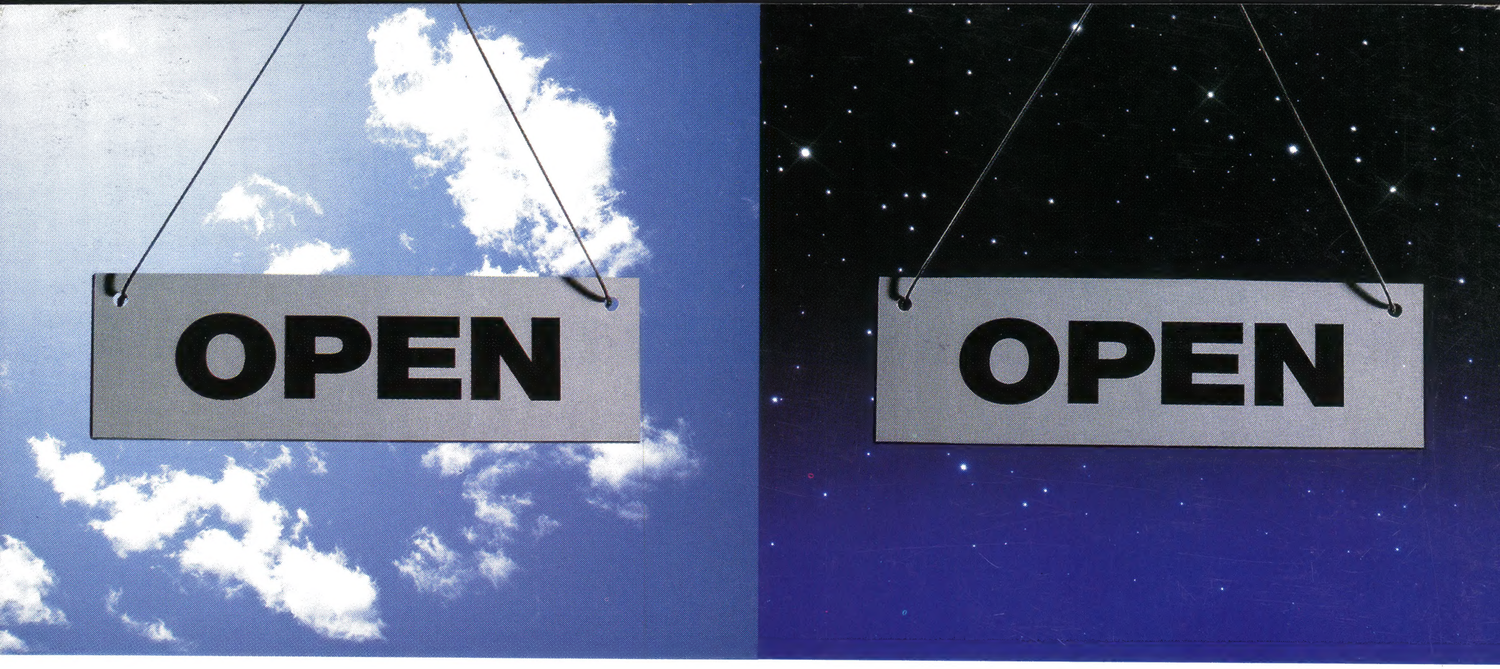

The Alcatel Help Line never closes.

Alcatel understands that a communications company is only as good as the support it provides. Which is why we've introduced the Alcatel Help Line. Open 24 hours a day, 7 days a week, the Alcatel Help Line provides our customers with focused technical support and assistance. Further evidence of Alcatel's commitment to the highest quality service and after-sales support.

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